Bittle

Model Engineer

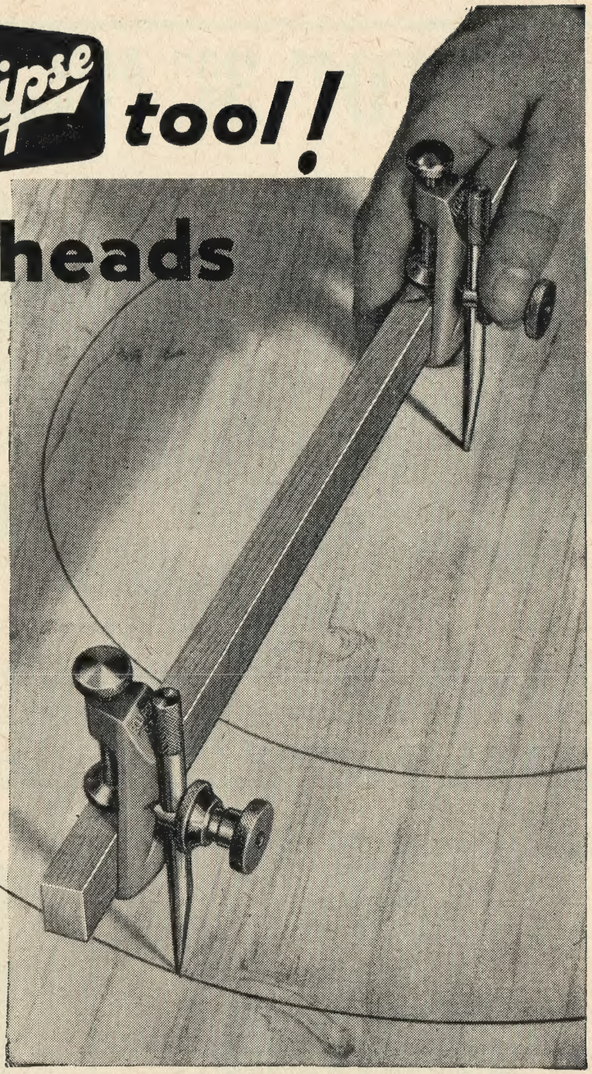
THE MAGAZINE FOR THE MECHANICALLY MINDED

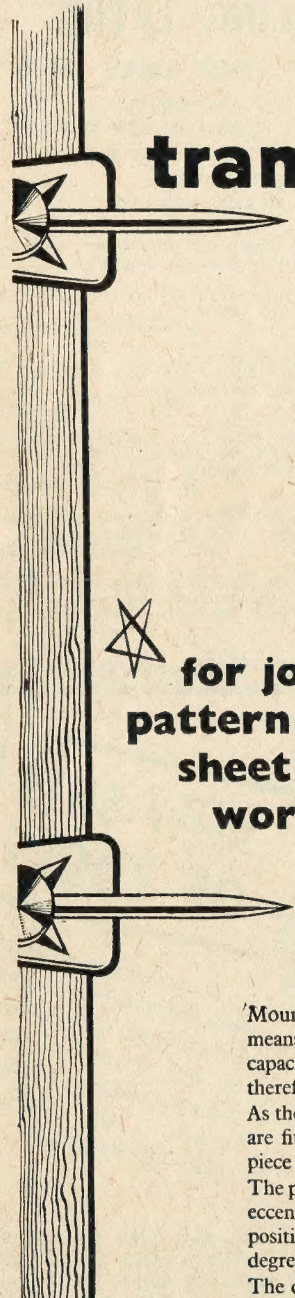
VILLAGES IN MINIATURE

ONE SHILLING 11 APRIL 1957 VOL 116 NO 2916

Another *Eclipse* tool!

trammel heads





for joiners, pattern makers, sheet metal workers

Mounted on a suitable beam, "Eclipse" Trammel Heads provide an efficient and convenient means of laying out the distance between two points and of scribing arcs and circles outside the capacity of ordinary dividers. They are equally useful for metal, wood and plastics and are therefore invaluable for pattern makers, joiners, sheet metal workers, machinists, etc.

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11 APRIL 1957 VOLUME 116 No 2916

Model Engineer

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Incorporating SHIPS AND SHIP MODELS

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NEXT WEEK

Bi-colour water level gauge: A device for distinguishing steam from water by colour screens

Small marine boiler: A power unit to propel the model boat

Simple prototype for beginners: It is possible to run a comparatively large engine on a small gauge

Readers' models

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All correspondence should be addressed to the Editor, Model Engineer, 19-20, Noel Street, London, W.1.

Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

ROBERT H. R. CURWEN, the writer of the article on the radio-controlled launch *Vanessa* described in this issue, will be known to many readers for his progressive work in several fields of model engineering, and particularly small i.c. engines and their application.

He was one of the first exponents of model car racing in this country and he did much to develop the design of suitable engines and transmission gear for these models. Of recent years his activities have been more prominent in the model power boat field, and they have included the construction of craft in both speed and prototype classes, and experiments in radio-control.

The boat *Vanessa*, with her powerful but almost silent Seal four-cylinder engine, has given an impressive performance at many M.P.B.A. regattas, both under remote control and in free-running events. The articles on this boat, based on real practical experience, will undoubtedly be welcomed by many readers as a valuable contribution to up-to-date developments in model power boat design.

Plastics

OUR recent series on the use of plastics has attracted a great deal of interest, not only among amateur workers but also in light industry, and I am glad to see that many manufacturers of basic plastic materials have shown a very helpful spirit in respect of inquiries concerning retail supplies.

With regard to the hand-operated press for making pressure mouldings, formerly produced by Messrs Wright and Weaire Ltd, and stated to be now unobtainable, I have been informed by Rendar Instruments Ltd, All Hallows Works, London, N.17, that they took over the manufacture of this appliance, known as the Labpress, some years ago, and that it is in increasing demand, not only in small workshops but also in the development laboratories of large electrical, electronic and engineering industries.

R. H. Whitelegge

I LEARNED with regret of the death, on March 9, of Mr Robert H. Whitelegge, who was a well-known personality in the steam locomotive profession. He was 84.

Robert Harben Whitelegge succeeded his father, Thomas, as Locomotive Superintendent of the London, Tilbury and Southend Railway in 1910 and held that post for two years when the Midland Railway took control.

In 1918, he was appointed to a similar position on the Glasgow and South Western Railway and remained there until 1923. He retired from the railway to found the business of Whitelegge and Rogers, the consulting mechanical engineers in Victoria Street, London, and he was actively associated with it for about 20 years.

As a locomotive engineer, Mr Whitelegge will be remembered best

SMOKE RINGS . . .

as one of the pioneers of large 4-6-4 type express passenger tank engines, a type that he introduced on both the L.T.S.R. and G. and S.W.R., as well as for the intensive rebuilding programme he carried out on the engines of the latter railway. In the Science Museum, South Kensington, is a model that he built of one of his Tilbury 4-6-4 tank engines finished in the style he intended to use on the prototypes.

He was a vice-president of the Stephenson Locomotive Society, and to the end of his life his main interest was the steam locomotive.

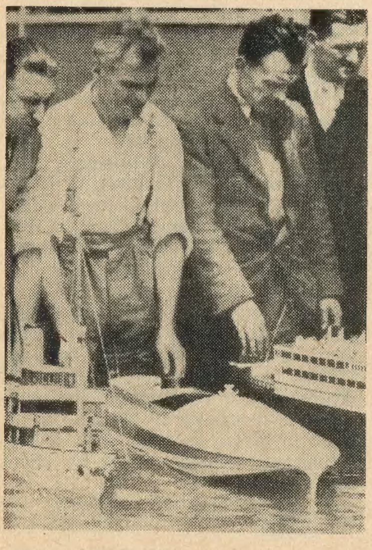
The late Mr J. Vines

THE Victoria Model Steamboat Club has lost yet another of its members who has contributed to the practical development of boat and power plant design, namely Mr J. Vines, who was a regular competitor in prototype events, both in local and provincial regattas, up to the beginning of the last war.

His flash steam launch *Silver Jubilee* was a masterpiece of design and craftsmanship, the performance of which has never been surpassed in its class, and it is doubtful whether any model power boat ever built could claim such a consistent record of successes in steering and nomination competitions.

In all his pursuits, which included cycling and watch repairing as well as model engineering, he was never satisfied with anything less than perfection; every detail had to pass the most exacting standards in quality, finish and function before being put into service. Some years before the war he was commissioned by the late Sir Malcolm Campbell to build two super-detailed models of his yacht, which, in common with his record-breaking car and speed boat, bore the name *Bluebird*.

J. Vines with SILVER JUBILEE



The absence of Mr Vines from post-war regattas was entirely due to failing health, which was a great trial to him in view of his former activity, and for the last two or three years he was almost completely incapacitated. It is worthy of note that there is every reason to hope that family traditions will be carried on by his sons, one of whom is a professional model maker and the other a well-known road racing cyclist.

York Museum

THE removal of *City of Truro* from the Railway Museum at York has left a gap that has led to a slight rearrangement of the other exhibits. The result is that space has now been found for two other historic locomotives: North Eastern Railway 2-4-0 No 1463 and Great Northern Railway 4-4-2 No 251. Until recently these two engines have been stored in the paint shop at Doncaster Works.

Actually, N.E.R. No 1463 has returned to York after an absence of some years, whereas G.N.R. No 251 has gone to York for the first time since she was withdrawn from service.

No 251 was the first of H. A. Ivatt's large Atlantics and was first put into service in 1903. It will be recalled that she, together with No 990, *Henry Oakley*, of 1898, ran the special *Plant Centenarian* from Kings Cross to Doncaster and back on two occasions in September 1953 in connection with the Great Northern Railways Doncaster Centenary celebrations.

On Sunday, April 28, *City of Truro* will work a Railway Correspondence and Travel Society's special, departing about 11.20 a.m. from Reading General to Bristol and back via Newbury. On the return trip she will come right through to London, arriving at Paddington at 9.15 p.m.

He "saw" his plan

THE idea of building a model village came to Mr Palmer in a kind of Alice-in-Wonderland dream. He is quite definite about this. In his article in this issue he tells how the complete scheme seemed to drop in his mind without conscious effort.

This strikes me as being an unusual experience for a model engineer, wedded as he is to blueprints and working drawings, and I wonder if it is as unique as it sounds.

Cover picture

John Simmonds of Southsea at work on the model village which has occupied him for two and a half years. He gave up his job in shipbuilding to devote time to the task. The village, to a $\frac{1}{16}$ scale, includes shops, farms and a sports field. On pages 522 to 524 Mr R. Palmer describes how he, too, built a model village—in his back garden.

Have other readers "seen" a project in its entirety without needing to evolve a plan by logical step-by-step reasoning?

"Saucer" was model

BRITAIN'S Air Ministry has not been launching flying saucers. We have this assurance from Charles Orr-Ewing, Under-Secretary for Air. Orr-Ewing told the House of Commons that a flying saucer spotted near Wardle in Lancashire at 10 o'clock one night "emanated not from outer space but from a Rochdale laundry." It consisted, he said, of two small balloons filled with hydrogen and illuminated by a flashlight bulb.

But why should a laundry in Rochdale or anywhere else send up a balloon at night? The Under-Secretary, alas, could explain that too. The balloon belonged to a mechanic at the laundry who was planning a radio-controlled model airship!

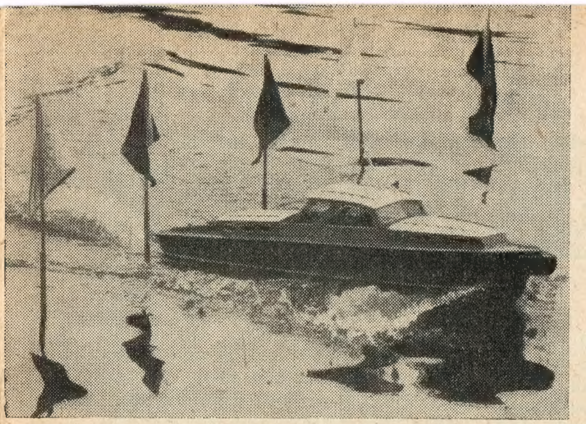
Models 20 years ahead

A REMARKABLE tribute to model yachtsmen is paid in *Amateur Research*, a publication of the Amateur Yacht Research Society.

In an article on sail research, the author says:

"In most Western countries there are well established classes of model yachts racing on ponds and reservoirs. They use a 'Vane' self steering gear which keeps them on a constant course to the wind and the better ones have a standard of style and finish seldom seen in their full scale sisters. Their owners claim that they are 20 years ahead of full scale yachts in development and I can well believe this, such is their keenness and workmanship. Here, again, is a method of research which anyone with a new idea could use. If he can win races against the present yachts, his idea is really good, believe me."

Such acknowledgment of the important part which models play in developing prototypes is not always made.



VANESSA

a radio-controlled model power boat

First of a short series by R. H. R. CURWEN which will describe the construction of the vessel and the installation of the radio equipment

ALTHOUGH DESIGNED mainly for radio control work, *Vanessa* has also been run in the steering and nomination events at many of the M.P.B.A. regattas over the past six years, and has proved herself quite suitable for this purpose.

It would have been impossible to produce a boat ideal both for straight running and for competition in tortuous radio-control steering events; and as a decent turn of speed was considered essential, the normal type of launch hull was adopted.

The hull was built to the lines of a B.O.A.C. seaplane tender and fitted with top works which were modified from an illustration of a Swedish designed cruiser, with the result shown in the photographs. Power is provided by a 15 c.c. Seal engine, driving the propeller through a centrifugal clutch, which disengages at tick over and allows the boat to remain stationary—a feature which adds greatly to the pleasure of running under radio control and is most convenient when awaiting one's turn in other regatta events.

HULL CONSTRUCTION

I will not describe the building in detail as the hull was made in the normal manner by skinning with resin-bonded ply over a rigid frame; the absence of hollow camber and flare making it a simple matter to apply the bottom and topsides in single pieces, assisted by a few brass pins and a supply of that indispensable resin glue.

As the boat was to be transported in the luggage boot of my car, this limited the overall length to 3 ft 6 in. giving a beam of 12 in. The frames were built up from $\frac{7}{8}$ in. × $\frac{1}{4}$ in. hardwood and fixed to a rigid building board to allow the keel, chines and inwales to be fitted.

I can remember the occurrence of no snags during the building of the hull until the painting of the load waterline had to be tackled, when I was kindly offered by my old friend Graham Caird a lining brush, with the assurance that it would enable the job to be done in a couple of minutes, with no difficulty.

This was a small thing with long flowing hair—about two inches of it—and no doubt due to my inexperience and the fact that the brush had obviously taken a dislike to me, I produced a line which no ordinary water could be expected to follow.

My advice to anyone about to use one of these things for the first time would be to have a couple of hours' practice, or to take the alternative course of painting between two strips of cellulose tape which can be removed while the paint is tacky.

Deck fittings have been added since the photographs were taken, and comprise fairleads, cleats, and mushroom ventilators, which together with the mast and searchlight were cut and filed from aluminium alloy which, after buffing, bears a fair resemblance to chromium.

Two lifebuoys are now carried on the roofs of the deckhouses and a dinghy will be added this year; but it will be obvious that more time is spent below deck than above. I should perhaps mention that red and green lenses for the navigation lights, now fitted to the sides of the wheelhouse, were turned from toothbrush handles which had to be sacrificed to the cause of realism.

Vanessa's displacement worked out at 20 lb., which experience has shown is several pounds overweight for a hull of these dimensions; and from the position of the load waterline, this will be obvious to those familiar with hard chine boats.

The engine and radio gear are made instantly accessible for adjustment by the hinging of the wheelhouse and cabin roofs, and the switch-panel and hand throttle lever can be reached through the rear opening of the wheelhouse as shown in the photographs.

An ignition switch, which is visible on deck, is in that position for the special convenience of the sometimes harassed "stoppers" in nomination events who often have little time to search a boat for some means of stopping the engine while other craft bear down upon them.

ENGINE DETAILS AND MODIFICATIONS

The Seal was built in accordance with Mr Westbury's instructions published in MODEL ENGINEER in 1947, and all machining was carried out on a Myford ML2 lathe of 3 in. centres. Practically all the work on the engine block, including the boring of the cylinders and valve chambers, was completed with the block mounted on the cross-slide or the vertical slide; and to increase the cross-slide travel to cover all the bores, a $\frac{1}{2}$ in. packing was inserted between the front of the slide and its feedscrew bearing plate.

The only departures from standard were the drive to the distributor and water pump, and a slight modification to the splash feed oiling system.

As the small spiral gears for the right-angle drive were not at the time available, and a larger pair of $\frac{7}{16}$ in. p.c.d. were to hand, a new and larger gear housing was machined from dural and fitted so as to carry the shaft at 20 deg. from vertical.

This angling was necessary to clear the front end of the crankshaft, from which an auxiliary gear was to be driven. A detachable cover is fitted to the top of the new housing and this allows the insertion and withdrawal of the shaft complete with its gear, without disturbing the housing.

Pistons are of cast iron working in liners of similar material, and although no rings are fitted, sufficient metal is left to allow this to be done in the future if loss of compression should occur through wear.

Unless one is able to obtain centrifugally-cast iron of known quality for these parts, great care should be taken when turning and boring to watch for warping and ovality, and to leave, if necessary, a suitable allowance for lapping. The liners which I made for the Seal were found to be about $\frac{1}{2}$ thou. oval after machining from what was reputedly centrifugally-cast material.

When turning cast iron, the sound

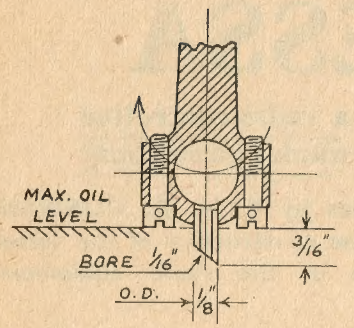


Fig. 1: *The big-end oil dipper*

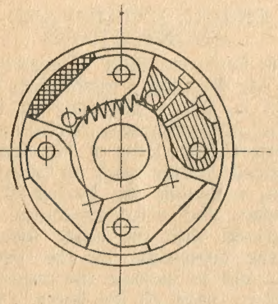


Fig. 3: *Details of the clutch shoes*

of the cut will indicate when the grain of the metal runs across the diameter; and the tool, I believe, removes more metal when cutting across the grain—an effect which no doubt would not be so noticeable on a heavier lathe.

LUBRICATION

In its original form with the oil level adjusted to allow the big-end caps to dip, the engine was rather prone to oil up the sparking plugs, in spite of well-fitting pistons and good compression.

An improvement to this state of affairs was made by chamfering the inside edges of the piston skirts to a knife-edge, in order to assist in scraping the oil from the cylinder walls, and by the fitting of dippers to the big-end bearing caps to reduce the amount of splash. These consist of small brass tubes screwed and sweated into the caps as shown in Fig. 1, the oil level and the baffle plate being lowered to suit.

VALVE SPRINGS

To avoid unnecessary wear of the valve gear, care was taken that the valve springs should be no heavier than necessary, and they are, therefore, of sufficient strength to avoid bounce up to 10,000 r.p.m. and no more.

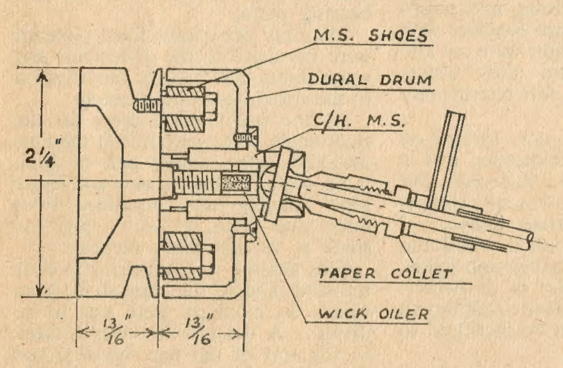
The calculated figure to achieve this is approximately 1¾ lb.; and as the engine peaks at about 5,000 r.p.m. and will reach 9,000 r.p.m. on no load, this pressure is satisfactory.

Suitable springs consist of seven turns of 22 s.w.g. steel wire wound at a pitch of 0.1 in. They can be cut from the 12 in. lengths obtainable from Terrys of Holborn Viaduct. The spring pressure can be easily checked by mounting a valve assembly in a cage as fitted to the engine and pressing the stem on the tray of a spring balance, or even the kitchen scales, until the valve is lifted the specified distance.

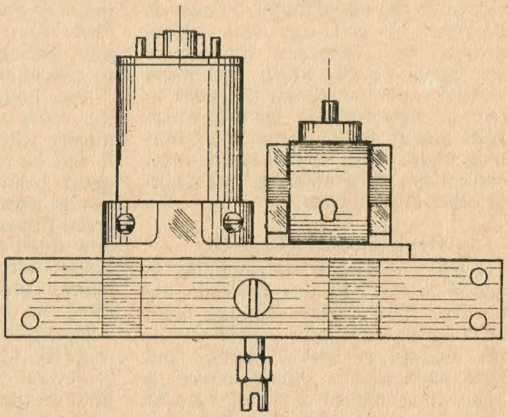
CENTRIFUGAL CLUTCH AND DRIVE

The clutch is mounted direct on the flywheel as shown in Fig. 2, and disengages below 1,000 r.p.m. when the Seal is throttled down to tick over. The dimensions shown in Figs 2 and 3 are satisfactory for steel shoes but they should be reduced somewhat if a heavier metal such as brass is used for these parts.

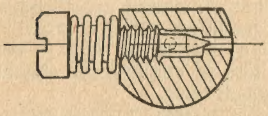
Linings are cut from the material used for cycle brake blocks, and screwed to the shoes as shown. To ensure that the lubrication system

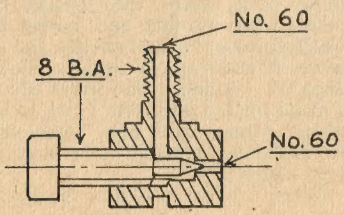


Above, Fig. 2: *Details of centrifugal clutch*

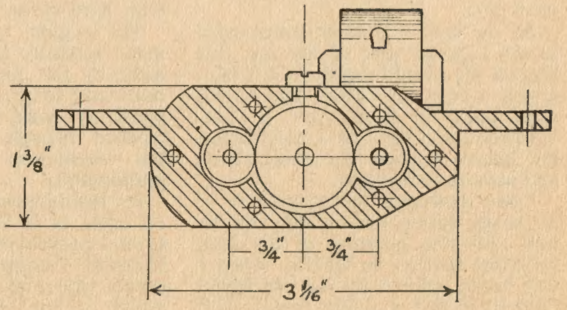


Top, right, Fig. 7: *General arrangement of the magneto and the generator unit*





Lower, right, Fig. 8: *Section view through three-speed gearbox*



Left, Fig. 5: *The air bleed for slow-running adjustment*

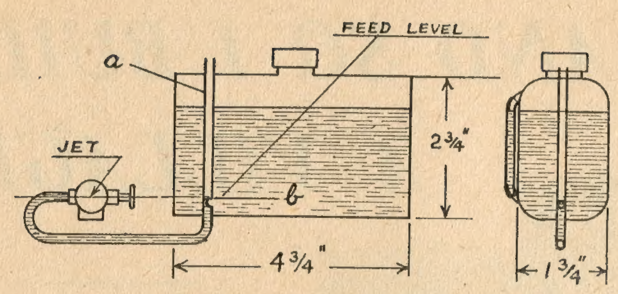


Fig. 6: *Details of the fuel tank*

works as it should the engine is mounted with the crankshaft horizontal, which makes it necessary to use a universal joint to cope with the rather steep drive to the propeller.

A normal type of ball-and-pin coupling is employed here, attached to the prop shaft with a split tapered collet. I have found the use of collets most convenient for connections of this type and in any case the rotation of the engine is in such a direction as would tend to unscrew any right-hand threaded locknuts.

I often wonder whether propeller efficiency suffers as a result of the variation in the speed of rotation of the output shaft which is a feature of a single universal joint of this type.

One day, perhaps, I shall check this point by fitting a coupling of constant velocity type; or by using a short cardan shaft with two ball-and-pin couplings, each arranged to drive through an equal angle and having their pins at right angles to each other. With this arrangement, the fluctuation in velocity due to each joint would cancel out.

CARBURETTOR TUNING

In describing the carburettor, Mr Westbury mentioned that some "cutting and trying" of the throttle barrel is nearly always necessary; and this proved essential in my case, the "cuts" being taken in very small slices with needle files and a tiny scraper between each of the many test runs which were necessary.

To save future constructors from the majority of the "trying" parts of this job, and to assist those who have unfairly condemned this carburettor in the past, I have drawn in Fig. 4 the final shapes of both the intake and discharge openings of the barrel together with the necessary dimensions.

No changes to the body of the instrument were made other than the fitting of an air bleed (Fig. 5) which takes the place of the upper fixing screw of the barrel-retaining cover and can be used for the fine adjustment of slow running if this is found necessary.

After the initial setting of the jet adjustment screw, the carburettor allows control of the engine over the full speed range and copes with all normal changes of load provided by the propeller.

A useful tip, following full-size practice, is the insertion between the carburettor and the manifold joint of a spacer of heat insulating material—red fibre of $\frac{1}{16}$ in. thickness is suitable—to prevent the overheating of the carburettor body and the vaporising of fuel in the jet tube. If this is not done, slow running will be erratic when the engine is hot.

FUEL FEED

For easy starting and good slow running, the fuel level must be held only just below the jet orifice; and this is achieved in *Vanessa* by means of an automatic chicken feed arrangement built into the fuel tank as shown in Fig. 6.

The only essential for the successful operation of this system is that the tank must be mounted above jet level, which is easily arranged in the case of the Seal with its low mounted carburettor; and the tank does not project above deck level. But for use with an o.h.v. engine the tank could be mounted above deck level and concealed by the wheelhouse.

Operation is as follows. The feed and vent pipe, *a*, which is open at its upper end, passes through the tank and direct to the carburettor, and a small hole, *b*, which determines the feed level, is drilled in the side of *a* near the bottom of the tank.

After filling up, the level of the fuel in *a* will be equal to that in the tank, and the airtight (most essential, this) filler cap must be replaced. As soon as fuel is drawn by the carburettor, the level in *a* will drop until the top of hole, *b*, is reached, at which point the tank becomes vented to atmosphere via *a* and *b* and feeds fuel to the jet as required.

If the jet needle is not normally screwed home after running, a stop valve should be fitted in the fuel pipe; and to avoid the loss of fuel which can sometimes occur from the open

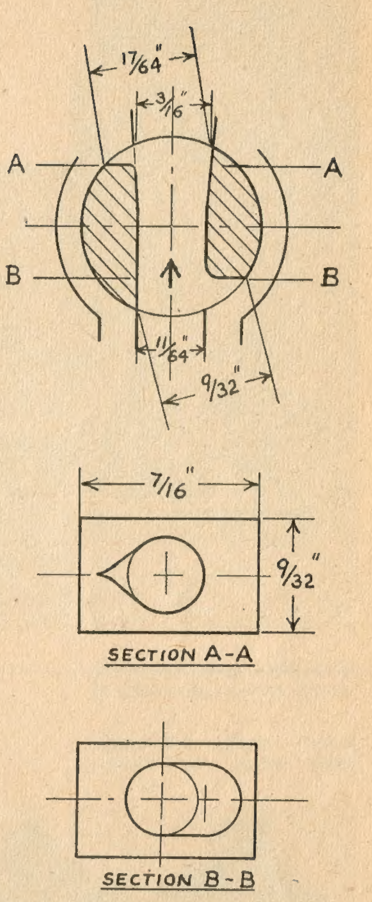


Fig. 4: *The carburettor barrel*

end of the vent pipe if the tank becomes warmed by the sun it is advisable to loosen the filler cap when not in use.

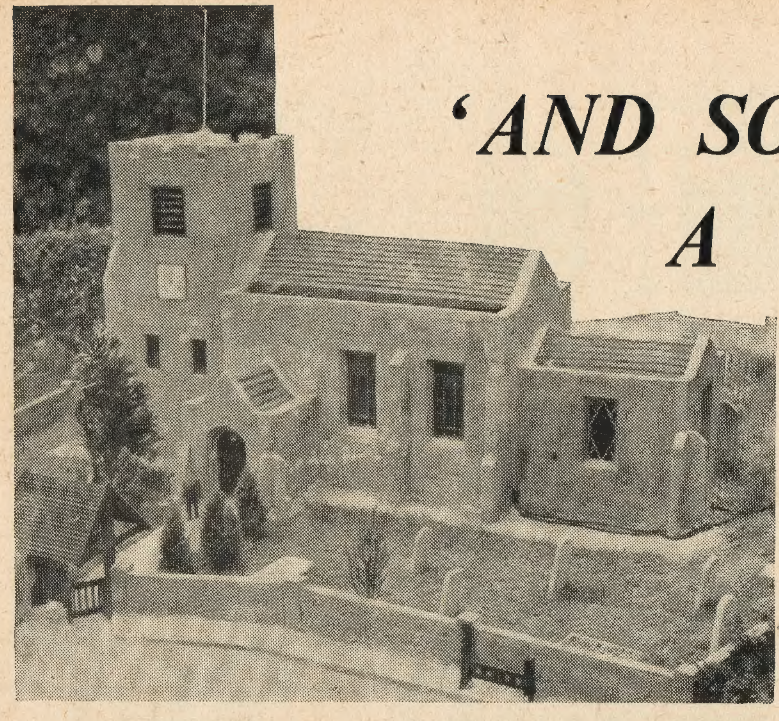
My own tank is made from a petrol lighter fuel tin which is of convenient shape and size for this purpose and which is fitted with a level gauge consisting of a piece of clear plastic tube pressed over short stubs of copper tube soldered into the tank as shown.

● *To be continued.*

GEAR CUTTING

Gear Wheels and Gear Cutting, by Alfred W. Marshall, explains the principles which govern the formation and numbers of the teeth for a given mechanism and describes the types of gears in general use.

There are numerous illustrations in this 92 page book, price 5s. 9d. post paid, which can be obtained from Percival Marshall and Co. Ltd, 19-20, Noel Street, London, W.1. Rate in U.S.A. and Canada is $1.00.



'AND SO I BUILT A VILLAGE'

R. PALMER tells of an Alice in Wonderland dream that came true

The model church from which church services are relayed

Below: Author and family stroll round the village

NOT, of course, that it was as simple as that, but then Rome wasn't built in a day.

My village was built to a scale of 1 in. to 1 ft and although there were eventually some 85 buildings, it was not quite the monumental task one might expect. This Lilliputian venture began because of a $1\frac{1}{2}$ in. scale model I made of an 8 h.p. Marshall traction engine.

My two daughters found great pleasure in playing with it in the garden, but it was, of course, too heavy for them to carry indoors and my wife had flatly refused to give it permanent house room.

So the easiest way out of the difficulty, so it seemed, was to build a small shed to the same scale as the engine. Then, photographing the engine one day while the girls played with it and with their dolls' houses, which they assured me was where the "engine-driver" lived, I suddenly visualised in the background a nebulous shed for my engine in the shape of a barn or farm outbuilding.

I believe that then, like Alice, I sat down for a moment to rest in the sun. Whether sleeping or waking I'll never know, but suddenly I could see my garden transformed—I could see it filled with houses, houses no higher than my hip. A complete village in miniature.

From that day I thought of little else. Wherever I went (my work took me to various parts of the country) I found myself studying houses, buildings, anything that could be copied as a model. Always, I knew exactly how my village must look.

With the help of the local libraries, I soon had a stack of rough drawings and notes on the design of old houses, inns, etc. I measured the garden and found I could use 88 ft × 28 ft.

But the garden was on a slope, from the back of the house down to a protecting wall at the bottom. It would have to be levelled out a bit. I think my nerve nearly failed me as the spade dug into my lovely lawn! But first, as it was useless to dig haphazardly, I had to make a miniature of my intended miniature.

I cut a board to measure 88 in. × 28 in., procured a sack of clay, and on the board fashioned the plan I had in mind. There was a hill at the bottom for the castle, a smaller mound for a windmill, here the bed of the stream, a valley here, a bridge there and so on. Then I made rough, solid wooden models of the buildings and placed them as they were to be situated in the garden.

The garden was tackled; it was hard work, but eventually I had my river bed, valleys, hills and roads running through. I dug out two ponds, one on a higher level than the other, so that when the top pond was full it would overflow into the stream and discharge into the lower one.

This in turn overflowed into a sump, which contained 10 gal. of water. From the sump the water was pumped through a concealed pipe into the top pond. Very simple but very effective.

My next job was to construct the houses. They had to be weatherproof and concrete seemed to be the answer. I had never mixed cement and hardly knew where to start. From a builder I gleaned the information that a mixture of three parts plasterer's sand to one part cement would give a good consistency.

Now where to build the houses? I had a cellar with a stone floor, so I fitted a bench and electric light, ordered cement and five yards of sand (which incidentally was tipped in the front garden and had to be bucketed indoors!) and I was away.

My "plan" was set up on the bench, with all the buildings numbered. With some trepidation I started my first house (the simplest one I could find). First I made a frame, using 1 in. × ½ in. battening.

On the floor I laid newspapers, to prevent the cement sticking to it, then the frame. Next the windows were put in place and finally a wooden door which I had previously made. Cement was poured in and the whole left for two days to set.

This first house was a simple four-sided job needing four separate frames. After two days I lifted these pieces, peeled off the newspaper, and with an old round file and a piece of batten, I marked off the "bricks" by inscribing along the batten with the file.

Tudor style

My first house being a success (at least it didn't disintegrate when moved!) I became more ambitious. Different slopes to the roofs and gables were introduced and I experimented with Tudor-type buildings.

Always, I made the walls in exactly the same way—even the church for which I had miniature leaded windows made. Eventually I had all the wall-pieces for some 85 buildings—all separate, of course, as they had to be assembled on their actual sites.

The next job was to build the foundations for the buildings. I levelled sufficient ground to take a particular house, then placed a frame on the site and filled it with a mixture of three parts washed ballast to one of cement. I lost three spirit levels during this operation!

The bases completed, I carried the pre-cast houses to the garden and stacked them near their appropriate sites. Came my first assembly.

I have often heard my wife declare that she has only one pair of hands. Regretfully, I had to agree that an extra pair would undoubtedly be an asset. Or that I could, again like Alice, either grow a very long arm or shrink myself for a while, for I had to hold together four wall sections and, with angle-pieces at each corner, secure them with Rawlplugs!

Into the windows, I tacked a set of small curtains—and one roofless house was assembled. So it was with each building. Next I added chimneys of varying designs. These were made in a box mould measuring some 1 in. × 2 in. × 1 in., in solid cement.

The chimneys were fixed inside the houses, packed up if necessary so that they would be relatively high when the roofs were fixed. These were, I think, the most difficult part of the whole project. Time and time again a roof would collapse, or gather itself into an avalanche and descend while I feverishly slapped on more and more cement.

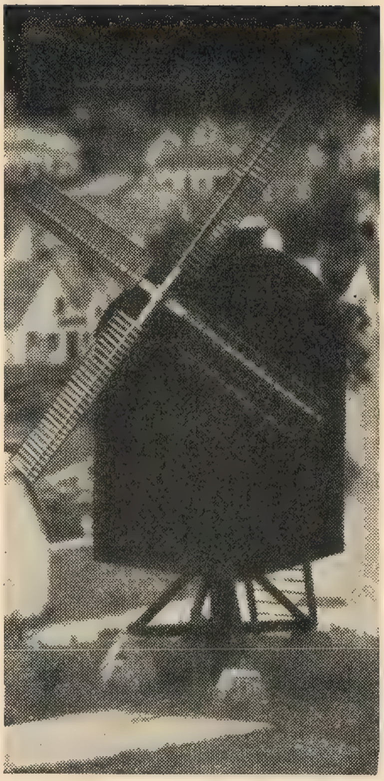
I formed a bed for the roofs from thin board, fitting it ½ in. below the sides of the walls. On the outside of the walls I Rawlplugged narrow battens to keep the cement from rolling off. After continued experiment I found the right consistency.

The roofs, always an evening job, were carefully levelled off. They were about ¾ in. thick. I covered them and next morning, often at crack of dawn, I marked off the tiles. For thatched roofs I left the cement much thicker, overlapping more on the sides, and obtaining a "straw" effect by brushing with an old stiff broom.

Only two of the buildings were of wood—the windmill and the water-mill. These were made of wood cut to an exact representation of weather-board.

Electricity had to be laid on for the pump for the stream and to work the sails of the windmill. With the aid of a transformer and 12 v. bulbs, all the buildings were lit. On the high wall at the end of the garden, a large spot-light gave the effect of a benevolent moon.

A loud-speaker was fitted into the church, so that B.B.C. church services could be reproduced. The first time that Janice, my youngest daughter, heard this she waited expectantly on her knees by the church gate "for the people to come out!" From that day, Janice was never in two minds about things—there were definitely fairies at the bottom of *her* garden.



Top: The windmill which is driven by an electric motor

Right: A general view of the model

MODEL VILLAGE

Then came the task of painting the houses. A cement paint was used for roofs and walls, the latter in varying shades of cream and white with some pink-washed cottages. Doors and windows were given various colours and all Tudor type buildings had creosoted beams and doors.

Miniature lawns, kept clipped with scissors, and tiny gardens were planned. Most fascinating, perhaps, was the search in many nurseries for plants which resembled English trees and shrubs, but which were almost static in growth.

Surprisingly, I found many plants: very small yews for the church yard, a Chinese holly, prunus which was almost exactly a replica of our copper beech, hedging plants with remarkably small leaves; I even found a miniature rhododendron and miniature daffodil and iris.

A rustic scene ! A wagon load of logs passes the local, the wagoner keeping his mind firmly on the task in hand

The shops became the perquisite of the children. They found endless fun in dressing the windows. The most effective, I think, was the photographer's, in which we placed tiny photographs of the village.

It wasn't long before the local paper found the village—and it wasn't long before I came to appreciate the truth of the saying: "If a man write a better book, preach a better sermon or make a better mouse-trap than his neighbour, though he build his house in the woods, the world will make a beaten path to his door."

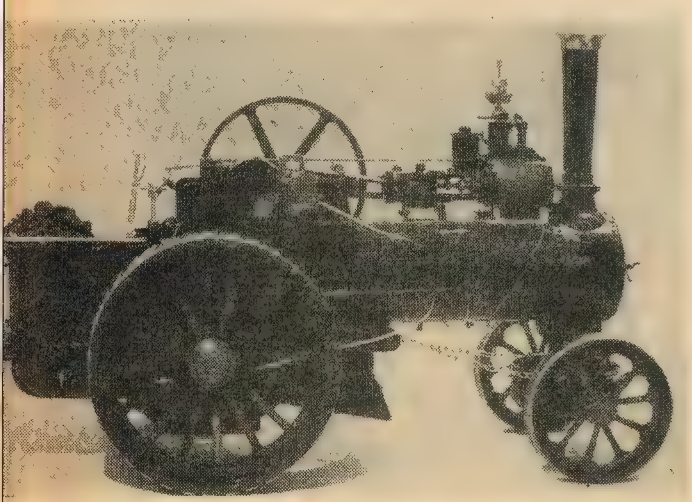
To me there will always be a line, not in Emerson's original, "or if he build a better model village." For the first invader was a Dutch journalist, whose letter regarding information was addressed, trustingly: *Mr Palmer. Please postmen seek his address. He has built a little village for his daughters* !

This was the forerunner of the 3,000 people who came to visit the village. For, at last, after four years' hard labour, the village was as perfect as I could make it. To me it represented a lovely inner vision translated into a material reality. Such achievement was reward in itself.

And, of course, stories in our house are never allowed to begin with "Once upon a time"; always they begin: ". . . so I built a village." ▣

ANOTHER ALLCHIN IS COMPLETED

By C. WOOD



I HAVE finished building the Allchin traction engine and here are some details about it.

The water pump seen on the footboard is for testing purposes only; it has now been removed and the more orthodox type fitted.

The boiler is of all-steel construction electrically welded, except for the firetubes which are $\frac{3}{8}$ in. o.d. copper expanded into the tube plates with a taper drift, after which a fillet of hard solder was run around each projecting tube end.

The cylinder block, slide-valve case and cylinder covers were all cast at home in gunmetal; other home-made castings included the T-rings for the rear and front wheels, chimney and chimney base.

The blower valve, cylinder draincocks, and two bib cocks were fabricated from bronze rod and silver soldered. All gears were machined from solid cast-iron plate $\frac{3}{8}$ in. thick. A single point cutter was clamped in the toolholder and a lever handle attached to the topslide. This combination used as a shaper, cut all the gear teeth with very little trouble.

On test the engine proved to be entirely satisfactory, the boiler, although all steel, is a very lively kettle indeed and the blast, or blower keeps the fire to an almost dazzling heat.

About two years' spare time elapsed before the model was completed. This is a first attempt at model making but certainly not the last. ▣

FIXED LATHE STEADIES

By GEOMETER

An accessory considerably extending the range of work on a centre lathe is the fixed steady which is mounted on the bed to provide intermediate support for long shafts and similar slender components in conjunction with the tailstock, or to support the outer ends of components having a lengthy projection from the chuck.

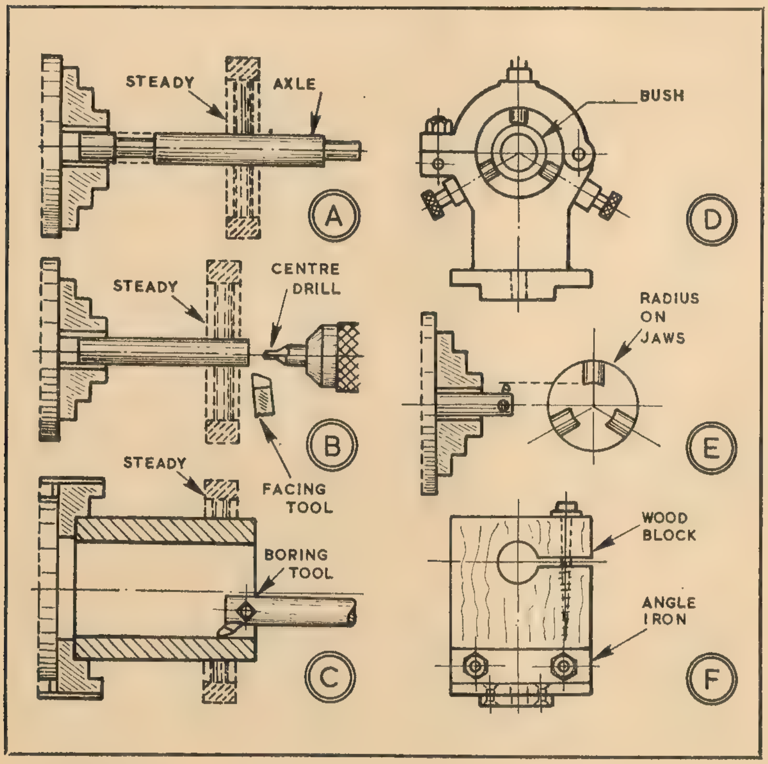
Without such support, a shaft of any length, even running between centres, is likely to wobble and would certainly be unstable and subject to chatter under cutting stress.

The normal steady supplied with a lathe is provided with three equally-spaced jaws which are individually-adjustable to the work, and tipped or capped with brass to obviate scoring. Each jaw is set just to touch and support the work, then locked by a nut or similar device.

Frequent oiling is necessary and adjustments must be made as the jaws wear and bed to the work. In the absence of a steady, either as an accessory or for a particular job, a temporary one can usually be contrived from a wood block with an angle-iron mounting to the bed.

How a steady extends the use of a lathe to work which could not otherwise be performed is shown at *A*. An axle too large to pass through the lathe spindle—even if this is hollow—and too long to run between centres is required to be machined with parallel concentric ends. With the tailstock removed from the bed, a piece of over-length shafting is held in the chuck, while the free end is supported in the steady and the turning—and any screwcutting—is done close to the chuck.

Afterwards the surplus pieces are cut off—as far as possible by parting tool, then finishing by hacksaw for safety. A set-up for facing the ends of a long tube can be made in the same way if a mandrel is mounted in the chuck for the tube to be pushed on.



On the same principle, shafts can be faced and centred, as at *B*. This is necessary when large billets are to be run between centres; or when it is desired to centre material accurately, there being a minimum to machine from the outside afterwards.

When a centre in a shaft has been damaged, such a set-up is necessary; and for truing, a fine boring or pointed tool may be required on the slide to avoid the swing and continuing wobble to which the centre drill would be subject. A setting for the steady jaws may be obtained by adjusting them with the steady close to the chuck, then bringing it back to the working position. Lifting and riding of the centre drill—from bad setting—is to be avoided on new work.

Support for hollow work, such as for boring a large bush, can be provided as at *C*, when the adjustment of the steady jaws has an effect on the parallelism or otherwise of the bore—so checks and adjustments are necessary well before finished size is reached.

When prolonged use is to be made of the steady and frequent adjustments to jaws would be necessary—apart from the possibility of marking the work from restricted local contact—a bush provides larger and more durable support. It can be from brass to fit the work and mount in the steady jaws, as at *D*. A screw in the side counteracts a tendency to rotate, and adjustment can be made by slitting lengthwise.

To reduce wear, steady jaws in general use may be given a radius, as at *E*, using a reamer or boring tool in the chuck and adjusting the jaws to it. Using a boring tool, the steady can be traversed by lightly gripping it to the bed, then pushing it along by saddle feed.

A built-up steady, as at *F*, can be a wood block bored on the faceplate, or as at *E*, and bolted to a piece of angle iron which has a guide tongue for the bed riveted to the underside. A slit and a screw can provide adjustment. ■

Fig. 1: *The assembled arm*

An improved gramophone pick-up arm

A design by W. E. ATKINSON which avoids some of the shortcomings of the commercial pick-ups

THOSE model engineers who are also music lovers, and who own modern record reproducing equipment, may be interested to know that quite a marked improvement in reproduction can be obtained by making and substituting the arm described in this article for any commercial arm they may be using.

I must put a word of advice here: the arm will improve the reproduction of any existing equipment, but it will not turn poor equipment into Hi-Fi.

The arm is constructed to use the Connoisseur Mark II pick-up head, manufactured by A. R. Sugden and Co., of Well Green Lane, Brighouse, Yorkshire, and anyone using this manufacturer's pick-up and arm can disconnect the fork-end fitting, with the wire attached, and transfer to the arm he builds. Or a new fork-end fitting and wire can be obtained direct from the manufacturers.

Anybody who is using any other make of pick-up, such as Leak or Ortofon, can transfer the pick-up heads to the new arm by designing an adapter to suit, but the measurements of arm length and off-set angle, as defined in the instructions, must be strictly adhered to.

A short explanation of matters pertaining to pick-up arms may be interesting to readers before going on with constructional details.

In making a gramophone record, the cutter head, which forms the modulated groove in the surface, travels in a straight line from the outside of the record to the centre. Whereas the pick-up arm is pivoted and moves across the surface of the record in an arc. This leads to a fault known as tracking error which, unless kept to a minimum, causes distortion and record wear.

There are two ways of reducing this fault. One is to increase the length of the arm; the length of the arm being defined as the distance in a straight line from the needle point to the axis of the vertical pivot. Obviously the longer the arm, the flatter the arc.

The second way is to offset the pick-up head so many degrees towards the turntable centre, this angle being known as the "offset angle," and to so position the arm that when the pick-up head is moved over the turntable centre the needle point overhangs the centre by a certain distance. This is known as "overhang."

The complete arm is 12 in. long and the correct offset angle for this length of arm is 16 deg., with an overhang of 0.360 in.

This will give a maximum tracking error of 2 deg. on the outside grooves where it is not quite so important, and zero error on the inside grooves where any tracking error would show up badly.

Any reader who would like to check this can do so by setting it out on a drawing board and drawing in the arm in various positions across the area of a circle drawn to represent the record.

CONSTRUCTION

The components of the arm are made from mild steel and brass, although any reader who would like to use stainless steel would be assured of a permanent finish, especially if he has the brass parts chromium plated.

The only parts it will be necessary to buy are the two pairs of miniature ball-bearings. These are obtained from B.M.B. (Sales) Ltd, of High Street, Crawley, Sussex, and will cost in the region of 27s. Two of type 77R2, $\frac{1}{8}$ in. bore × $\frac{3}{8}$ in. o.d., and two of type 77R3, $\frac{3}{16}$ in. bore × $\frac{1}{2}$ in. o.d., will be required. These bearings are fitted with dustshields, so when ordering specify that they must be lubricated with a drop of instrument oil and must not be packed with grease.

THE ARM

The arm is made from a piece of mild-steel rod $9\frac{7}{8}$ in. × $\frac{5}{16}$ in. dia. This is drilled $\frac{3}{16}$ in. throughout to form a thick-walled tube.

The drilling is really quite simple. Any good tool shop will supply a $\frac{3}{16}$ in. twist drill with about 6 in. of flutes. Using a good cutting compound, such as Trefolex, and drilling from each end, the job is soon done.

The weight carrying end of the arm is shown in Fig. 3. It is made from a piece of the same $\frac{5}{16}$ in. mild-steel rod. Note the $\frac{3}{16}$ in. recess at the unscrewed end. Use Trefolex when screwing so as to get a good clean thread.

The bracket to carry the arm and horizontal pivot bearings is shown at Fig. 4. It is made from a piece of mild steel of $\frac{3}{8}$ in. × $\frac{1}{2}$ in. section × $\frac{13}{16}$ in. long.

The $\frac{5}{16}$ in. drilling carries the arm and weight rod. The end in which the arm is to fit must be a tight push fit, whereas the end of the drilling in which the weight rod fits wants to be a light push fit.

The way to achieve this is to drill undersize, then feed in a $\frac{5}{16}$ in. reamer from the weight rod end and continue until the tapered portion of the reamer is not quite clear of the drilling. Test with a piece of mild-steel rod from the weight rod end until the desired tight fit is obtained. Put a small countersink at both ends of this drilling.

The letter U drilling is reamed for an accurate fit to the $\frac{3}{8}$ in. o.d. bearings. Note the centre pop mark shown on the drawing; this is important and must be accurately placed.

A distance piece is required between the two horizontal pivot bearings. It is in the form of a brass washer, a tight push fit into the $\frac{3}{8}$ in. bearing housing and has a $\frac{1}{4}$ in. hole through its centre.

The best way to make it is to face-up a stub of $\frac{3}{8}$ in. brass rod and sweat on a piece of $\frac{1}{16}$ in. sheet brass. Turn the outside diameter, slightly chamfer both edges, run a $\frac{1}{4}$ in. drill through the centre, unsweat and clean up. Do not do any assembling yet.

FORK-END FITTING ADAPTER

This is made from a piece of $\frac{3}{8}$ in. dia. brass rod, 2 13/32 in. long, and is shown at Figs 5 and 6. Drill through $\frac{1}{8}$ in., follow up by the $\frac{5}{16}$ in. drill, making sure it cuts dead true, then reverse in the chuck and drill the other end.

A word of warning here: before making this second drilling check the diameter of the shank of the fork-end fitting; it is made of plastic and may vary slightly. Turn the neck as shown in the drawing and then bend the offset angle 16 deg. before fitting the fork-end or machining the slots.

Bend as follows. Turn down the ends of two 9 in. pieces of $\frac{3}{8}$ in. mild-steel rod, one to fit right down the $\frac{5}{16}$ in. drilling and the other to fit the opposite drilling. Drill the turned-down end of each rod and fit into each a stub of $\frac{1}{8}$ in. steel rod; the stubs should project about $\frac{1}{8}$ in. Thoroughly round off the turned-down ends of the two rods.

Mark out on a large sheet of cardboard two pencil lines meeting at an angle of 164 deg. Insert the two rods in the appropriate ends of the adapter, heat up the neck in a small blowlamp flame, and very carefully bend until the angle of the two rods exactly coincides with the pencil marks on the cardboard.

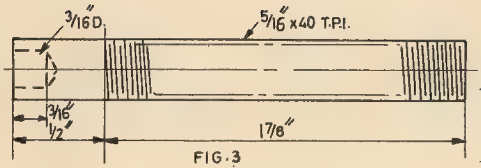
I have described this bending in some detail, because it is very easy to distort the thin-walled tubes unless the operation is performed as described.

Mark out and drill the hole for the fork-end fitting from the fitting itself, making sure the fork is kept parallel with the horizontal plane of the adapter.

Put two opposing slots in the opposite end by means of a hack-saw or milling cutter; $\frac{1}{2}$ in. deep is sufficient. Pinch in slightly this end of the adapter and you should have a good tight sliding fit when the adapter is pushed on to the end of the arm.

FITTING THE ARM TO THE BRACKET

Assemble the fork-end fitting into the adapter, feed the wire straight through the drilling in the arm, and press the adapter home on to the arm. Push the other end of the arm halfway into the bracket drilling, turn the whole lot upside down, grip the bracket in the vice and fit the pick-up head on the fork.



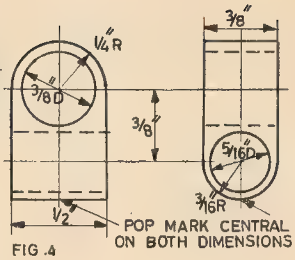


Fig. 3: Weight carrying end of arm. Fig. 4: Bracket for the arm

The distance from the stylus point to the pop mark on the bracket measured in a straight line must be exactly 12 in. Adjust the arm in or out until this measurement is obtained.

Carefully remove the pick-up head and adapter, slide the weight rod into the other end of the bracket, up-end the whole lot and grip the weight rod in the vice, silver solder the arm to the bracket, reverse in the vice, and silver solder the weight rod in position.

From the centre pop in the bracket, on a line running through it parallel to the axis of the arm, mark off a full $\frac{1}{16}$ in. either side. Drill through $\frac{1}{8}$ in. into the drillings of the arm and weight rod, remove the metal between the two drillings just made by file or end-mill, and you will be left with a slot $\frac{1}{8}$ in. × $\frac{1}{4}$ in. through which the wire from the pick-up can pass. At the same time allow the arm to rock on the horizontal pivot without interference.

Press the brass distance piece into position exactly halfway through and make sure it is dead square to the drilling.

THE COUNTER-BALANCE WEIGHTS

These are shown at Fig. 7 and are made from chunks of round brass which you will probably find in the scrap box.

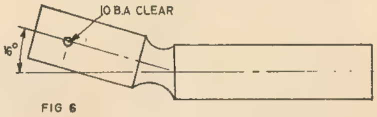
Their construction is a simple turning job, which requires no explanation. Make sure both portions work smoothly on the thread of the weight rod, then drive the plug in the outer weight and clean up by taking a skim across the face.

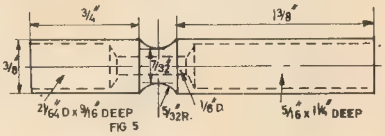
HORIZONTAL PIVOT FORK

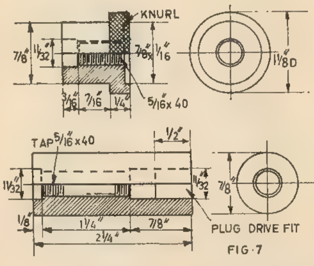
This is shown at Fig. 8 and is bent up from 14 or 15 gauge steel sheet. Bend the fork to shape before drilling the two $\frac{1}{8}$ in. holes in the arms and you can then be certain to drill them exactly parallel with the base.

This fork is silver soldered to the top of the vertical pivot bearing housing shown at Fig. 9. This is a piece of $\frac{5}{8}$ in. steel rod, $1\frac{5}{8}$ in. long bored through the centre and reamed to $\frac{1}{2}$ in. to take the vertical bearings.

The fork can be held in position for silver soldering by passing a piece of $\frac{1}{8}$ in. screwed rod through the hole in the base of the fork and through the housing, using a large flat washer at the bottom of the housing. Include a couple of spring washers before tightening up the two nuts. These will keep the two components tightly together when the







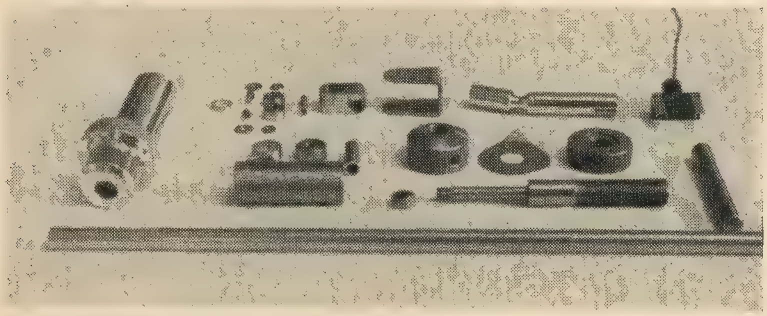


Fig. 2: The components of the pick-up arm

Figs 5 and 6: Fork-end fitting adapter. Fig. 7: Details of the counter balance weights

An improved gramophone pick-up arm

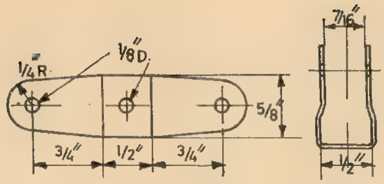


FIG. 8

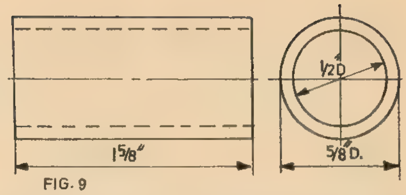


FIG. 9

Fig. 8: Horizontal pivot fork, showing dimensions when bent. Fig. 9: The housing for the vertical pivot bearing

heat expands the screwed rod. Adjust the fork exactly central over the housing and silver solder in position.

The horizontal pivot is made from a piece of mild steel rod ⅛ in. dia. × ⅝ in. long. It is advisable to add 1/32 in. to this latter measurement for adjustment when assembling.

The centre-holes in the miniature bearings are exactly ⅛ in., so try them both on to the ⅛ in. rod which is going to be used before cutting off. It will probably be necessary to ease the diameter down a fraction with a smooth file.

Drill through the pivot with a No 51 drill and tap down 8 B.A. from both ends. To complete the assembly the following are required: two 8 B.A. × 3/16 in. steel screws (any type of head except countersunk); two 8 B.A. flat washers; and two 7 B.A. flat washers, drilled out ⅛ in.

I have always found the easiest way to enlarge the hole in flat washers is to fasten them down on a small piece of flat board by means of three or more large-headed tacks driven into the wood round the edge of the washer; a drill of the required size can then be carefully fed through.

Make a trial assembly of the arm on to the horizontal pivot, without fitting the adapter, grip the vertical pivot housing and fork in the vice, put an 8 B.A. washer over one of the screws, and screw this into one end of the pivot.

Mount the two bearings in the arm bracket, push the pivot through one side of the fork, fit on one of the drilled-out 7 B.A. washers, put the bracket in position between the fork, push the pivot through both bearings and through the other 7 B.A. washer, and finally through the other arm of the fork, then screw the other 8 B.A. screw home until tight up against the end of the pivot rod.

Now the length of the pivot must be adjusted so that when both 8 B.A. screws are screwed right home (i.e. the washers butting up against the ends of the pivot rod) the arm is perfectly free to swing on the bearings and at the same time there should be no side play. It is far better to have a fraction of side play than any restriction at all on the movement of the arm.

VERTICAL PIVOT AND PEDESTAL

This is shown in Fig. 10 and is made from a piece of ⅝ in. mild-steel rod, 3⅝ in. long.

Machine to the dimensions shown. Make sure a ⅜ in. B.S.F. nut will go over the turned-down part of the thread at the bottom of the pedestal. Note the small grubscrew drilling; this is to tighten a clamp to hold the pick-up wire firm. A small brass or steel grubscrew should be fitted with its head below the surface.

Grip a 4 B.A. steel nut in the three-jaw chuck, run a No 26 drill through it and retap 2 B.A. This is the special nut for clamping the vertical pivot bearings together.

Three distance pieces are required as shown in Figs 11, 12 and 13. They can be made from brass tubing.

The upper distance piece is an easy push fit in the vertical bearing housing. Chamfer one outside edge slightly, feed that end in the housing first and press right up to the top.

The lower distance piece is a tight push fit into the vertical housing.

The centre distance piece holds the two bearings apart, on the vertical pivot.

The pedestal clamping nuts are shown at Fig. 14 and are made from 1 in. dia. mild-steel rod. The upper nut has a well-chamfered edge for neatness and three 3/16 in. dia. drillings placed, equally distanced, round the edge; these are for use with a small tommy bar for the final clamping when the arm has been located in position.

The steel parts, whether mild or stainless, look best when highly polished, with the exception of the fork and vertical pivot housing which can be painted in any colour to fancy. If mild steel has been used, parts can be heat blued and then polished with instrument oil which will give a good rust resistance.

The brass parts can be polished and lacquered or if preferred chromium plated.

ASSEMBLY

Mount the larger two bearings on the vertical pivot, with the central distance piece between, and clamp them tight with the special 2 B.A. nut.

Slide the assembly into the housing and press home the lower distance piece, until there is no up or down play between the pivot and housing, while at the same time the housing is perfectly free to revolve.

Clamp the pedestal upright in the vice, feed the pick-up wire down the arm through the slot and press the adapter in position.

Feed the wire through the hole in the fork and down through the centre of the vertical pivot and pedestal. Mount the arm in the fork as previously described.

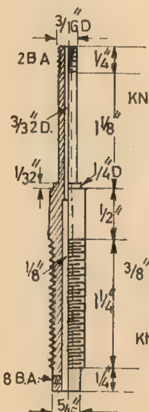


FIG 10

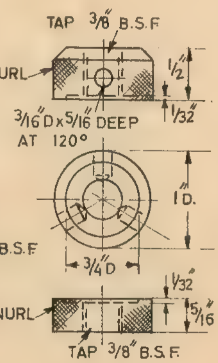


FIG. 14

Left, Fig. 10: Vertical pivot and pedestal. Fig. 14: Pedestal clamping nuts

Below, Figs 11, 12 and 13: The lower, centre and upper distance pieces

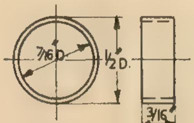


FIG. 12

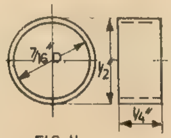


FIG. 11

FIG. 13

The pick-up wire should be clamped at the bottom of the pedestal by means of a ¼ in. length of ⅛ in. brass rod. File a flat on this piece of rod so that it can be pushed up the pedestal drilling with the wire in position. Tightening the grubscrew will cause the wire to be clamped. The wire should be so adjusted that the arm swings freely on the horizontal pivot without causing any movement of the wire where it passes through the slot in the bracket.

The photographs of the completed arm show it mounted on a simple bracket formed from steel sheet. I am giving no details about this as its design depends on how the turntable mechanism is mounted.

The arm is too long to be mounted on the ordinary turntable platform, which makes the bracket necessary. It is a good point, actually, since it helps to isolate the arm from that type of vibration known as "turntable rumble," and if a thin piece of rubber sheeting can be arranged between the bracket and the floor of the cabinet on which it is mounted so much the better.

The drilling in the top of the bracket should be in the form of a slot, and the bracket arranged with the slot pointing towards the turntable centre. This allows the pedestal to be moved towards or away from the centre for a final adjustment.

In the photograph of the unassembled parts can be seen a washer with a drilled lug on it. This is cut out of thin sheet brass and fits on to the pedestal between the lower nut and the bracket and forms an earthing washer for earthing the arm. An earth wire can be sweated to the lug.

The overhang setting gauge is shown in Fig. 15 and can be made from brass or aluminium sheet.

The best way to mark it out is to scribe the centre line, on which are put two fine centre-pop marks 12 in. apart. Set a pair of dividers to 0.360 in. and mark back along the centre line from one of the pop marks.

Make a third pop mark here, drill through and enlarge to ⅝ in. dia. The drilling at the other end is 9/32 in.

FIG. 15

Fig. 16: The scales designed by the author
Right, Fig. 15: The overhang setting gauge
Below, Fig. 17: A suitable design for armrest

dia. to fit over the turntable spindle. Cut to shape as shown in the illustration and the gauge is finished.

WEIGHING THE ARM

With a finely-balanced and pivoted arm like this it is usually possible to reduce the downward pressure of the stylus to a little under the maker's setting. This helps further in reducing record wear.

In the case of the Connoisseur head, the maker's downward pressure is 4 to 4½ grammes, but if the arm has been correctly made this can be reduced to 3 grammes.

For weighing this downward pressure accurately a simple pair of scales can be made (like those shown in Fig. 16), balanced on a knife-edge or two needle points as the illustration shows. I have given no measurements as all the material used came from the scrap box.

The arm has a little pan at one end to carry the weights and, equidistant from the centre at the other end, a little anvil on which the stylus point can rest, and which counterbalances the weight pan. A word of warning: both the arm and anvil must be made of non-ferrous metal.

A set of chemist's gramme weights can be purchased if wished; but it's much cheaper to make them out of a small piece of copper rod.

Turn down a short length of copper rod to a diameter of exactly 0.250 in. A piece of this exactly 0.144 in. long will weigh one gramme, so 0.072 in. will be half a gramme and double (0.288 in.) will be two grammes. All measurements must be made with a micrometer, and copper not brass must be used.

Make up a couple of half-gramme, four one-gramme and a couple of two-gramme lengths and you will have a set of weights and a pair of scales which will be useful for many other purposes.

The arm on its mounting bracket complete with pick-up head should now be arranged with the scales, so that the stylus point rests in the centre of the anvil and at such a height that when the scale arm is horizontal the pick-up arm is horizontal also. Put three gramme weights in the pan and adjust the balance weights until the arm is balanced.

MOUNTING THE ARM

The arm is mounted in the turntable cabinet in such a position that with the overhang gauge fitted to the turntable centre the other end butts up against the vertical bearing housing.

Adjust the height of the arm so that with the stylus resting on a record the arm is parallel to the surface of the record.

The adapter should be right home on the arm and turned so that the pick-up head is parallel with the record surface.

As the pick-up moves across the surface of the record when playing the two wires running down the pedestal will slowly twist. It is only very slight and not important, but arrange for this twist to be zero when the pick-up is at the outside edge of the turntable, then as the twist goes on to the wire it will tend to counteract the slight side thrust towards the turntable centre caused by the overhang of the arm.

A new armrest will probably be necessary, as it is unlikely that the old one can be used for the new arm. Fig. 17 shows a suggested design. The arm just rests in the bracket during record changing and can be clipped under the steel spring for safety when not in use.

Connect the pick-up wires into the amplifier, not forgetting the earthing wire, and your labours will be ready to make sweet music. ■

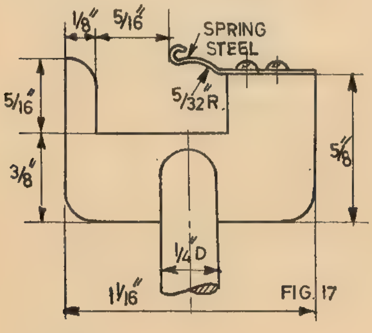
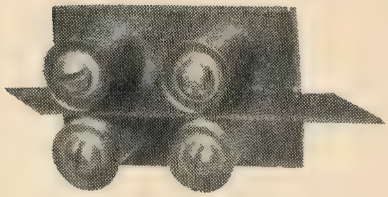


FIG. 17

Readers' hints

This is the feature where readers exchange worthwhile ideas on workshop practice



Above: The screw-slotting guide devised by Mr S. A. Stoney, and, below: details of construction

In the construction of period ship models great difficulty is often experienced in making the wood carvings and embellishments, especially if one is not an expert wood carver.

To start with I am modelling a Stuart Royal Yacht C.1674 and I think you will agree with me that that particular ship and period reached the heights of decoration, so I was faced with the task of finding something which would be easy to work in, not take too long, yet still look authentic.

Although the use of barbola paste has been previously mentioned for certain aspects of this work, I believe (although I cannot vouch for it) that I am one of the very few who has done all decoration using this method.

This covers all the decoration, such as frieze work, wreath ports, figurehead, stern works including cherubs, coat-of-arms, in fact all work which comes under the heading of "gingerbread." The materials and tools I use are the following: tin of barbola paste, bottle of barbola varnish, cup of water, camel hair brush, diluted Croid glue, large bodkin, crochet hook fashioned like a small chisel at sharp end, and a razor blade.

The method is as follows:

Wreath ports. A piece of barbola is rolled flat (as in pastry-making) to the required thickness, which can be very thin if needed. Leaves, etc., are cut out, then, picking them up on the end of a pin, a little glue is placed on one side and they are fixed on the port.

This work can be built up very quickly; according to the type of port; fruit or flowers can be easily added.

Frieze work and bulwark decoration. As above, all leaves, flowers, etc., are cut out with the blade and glued on the side of the ship.

Figureheads and other figures. A piece of barbola rolled roughly to the size of the head is glued on the place where needed, then the figure's body is added. Water is brushed on the head and body, and after two or three minutes, using the crochet hook and needle, the figure is formed. It is very simple if one has a photograph or a sketch as a guide.

Arms, legs or other features can be added. This is much the same way as children build things with Plasticene. Any type of decoration can be done this way. In all cases, after the work is glued to the ship, the barbola is wetted, allowed to get soft, then shaped and detailed with the bodkin or the crochet hook.

After allowing a day or two to throughly dry, one or two coats of varnish are placed on the figure. When dry, paint as usual. Although barbola dries fast, there is time to work at a comfortable rate. If it goes hard it can be softened by water.

Larger figures can be reinforced by bits of wire.—Basil Mace.

Contributions to this feature are invited from readers. Each tip published wins a 10s. 6d. Percival Marshall book token

SCREW-SLOTTING GUIDE

If you happen to have four new bushes handy, to act as guide pillars, here is a ten-minute set-up for accurately slotting the head of a machine screw without the aid of machine tools.

A small piece of either 3/32 in. or $\frac{1}{8}$ in. steel plate is cut to the dimensions shown in the sketch and four $\frac{3}{16}$ in. holes are drilled through to the approximate locations indicated. Next a hole is drilled through the centre of the plate to the size of the screw to be slotted.

The bushes shown in the sketch were $\frac{7}{8}$ in. long × 19/32 in. dia. × $\frac{7}{16}$ in. bore, for connecting-rod small-ends, but any near size will serve the purpose equally as well. These are set over the $\frac{3}{16}$ in. holes.

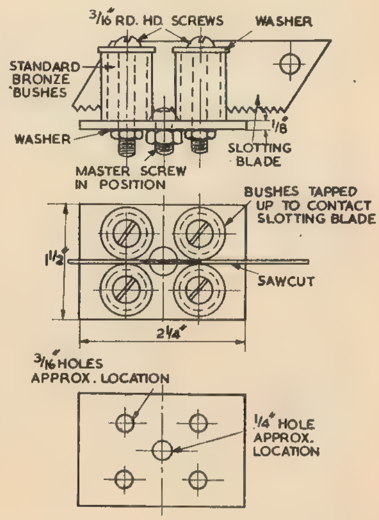
Take four $1\frac{1}{2}$ in. × $\frac{3}{16}$ in. cup-head machine screws and fit a $\frac{3}{16}$ in. steel washer, followed by a $\frac{1}{4}$ in. steel washer to each screw. Insert the screws through the bushes and the steel plate, then fit nuts underneath. Screw the nuts up finger tight and centralise the cap washers.

Take a factory-made screw with a perfectly slotted head of the same size as the one to be slotted and insert this in the centre hole, head upwards. Select a suitable size Eclipse 4S slotting blade; rest this in the slot of the master screw, then tap each of the bushes up until they just touch the blade, lining it up with the slot in the screw head—after the style of toolmaker's buttons.

Carefully observe that the blade rests exactly in the centre of the slot. Lift the blade and turn the screw 180 deg., then try the blade again, using a magnifying lens if necessary.

Once assured that the blade slides easily between the guide bushes and through the screw slot, the nuts may be tightened up, taking care not to disturb the bushes. Remove the master screw and fit the blank in its place, securing it by means of a nut and washer underneath, well tightened up.

Fit the handle to the blade. Level the steel base up in the vice and



commence the slotting, making sure that the saw is kept level all the time. It will be found that the result is equal to the factory-made screw, if not better. By means of small shouldered bushes of various bores, this jig can be used for most standard size screwhead slotting operations.—S. A. STONEY.

CHUCK JAW PACKINGS

When holding discs, or similar parts which are thinner than the depth of the jaw steps, in the outside jaws of a three- or four-jaw chucks it is often necessary to interpose some sort of packing between the work and the jaws.

Even after successfully getting such packings into position they have an annoying habit of falling out and losing themselves when a jaw is moved so in the hope of saving my fellow model engineers further vexation I put forward the following simple device.

Each packing consists of a U-shaped piece of fairly springy steel wire of whatever diameter is desired and which is easily clipped on to the chuck jaws as shown in the diagram.

If the hold of the clip is not too firm a light pressure on the work to be chucked will lay each packing perfectly flat against the face of the jaw and the work can be set to run true without any danger of the packings falling out.

A further advantage is that a loose packing can be discovered by waggling it with the fingers and the work adjusted accordingly.—S. J. APPLEWHITE.

GLAZING PROBLEMS

Make the frames for decklights and portholes from brass bar in the normal way with a parting tool.

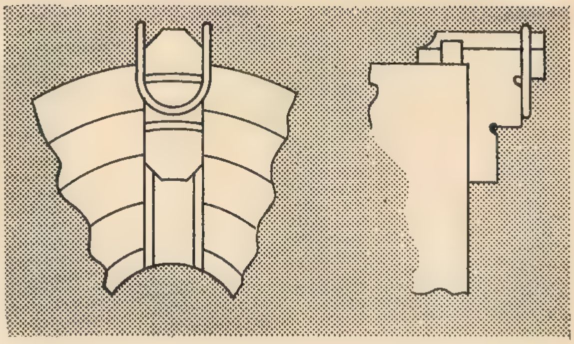
The bar is drilled for a sufficient depth to provide the required number of frames, the drill size being 1/32 in. smaller than the "glass." Before parting off, drill each one about 3/32 in. deep to the full diameter of the glass.

When all are ready turn a punch from brass or mild steel which will just fit into the recess for the glass and square the end off.

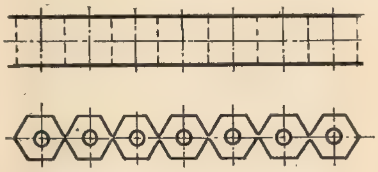
Lay a frame face upwards on the bench and put a piece of acrylic sheet on top. Centre the punch carefully by eye with the recess and hit it with a light hammer. This will punch a disc out of the sheet which will jam tightly into the recess.

It needs no cement, will not fall out and is quite watertight.—G. H. EVERITT.

Right: Details of chuck jaw packings designed by Mr S. J. Applewhite



Below: The method used by Mr Kingdom to make small nuts



MAKING SMALL NUTS

This is how I make a number of small nuts, 6 B.A. for instance.

Scribe three lines equidistant on the edge of a sheet of brass. On the centre line drill and tap the holes. Then with a saw-file cut notches at each section and with a fine hacksaw cut off each nut, or alternatively cut each one off as required and avoid losing them.—W. E. KINGDOM.

CHUCK JAW COVERS

Having been exasperated when adjusting a job in the chucks by bits of brass or copper shielding falling out I made covers to fit round the jaws of the chucks. These I fashioned from odd bits of copper sheet about 24-gauge.

Bend the copper round the jaw so that the join comes up the side, and solder. Make one size to go right round, then the others. Mark out for the step, flatten out the sheets and cut out for the step, then bend round the jaw, and hold while soldering with a cramp on the jaw.

When these clips are slid over their respective jaws they cannot fall off, and the chucking is made quite easy.

One of the old-time chucking appliances I still use is a so-called master chuck. This was made from an odd piece of steel to screw on to the mandrel nose and extended by about an inch. This was bored true to take various inserts, and can be used to hold all kinds of jobs.

It can be made of round or hexagon steel. I make mine round, with a knurled ring about halfway having a tommy-bar hole in it. The other end is bored to take a 1 in. shafting a sliding fit. This is held in position by an Allen grubscrew.

The inserts can be made to hold squares, hexagons and any odd shapes which are hard to hold in other ways; they can be useful with a screwed end to hold jobs where the periphery requires tooling instead of using a stub mandrel in the three-jaw, and for holding milling cutters.

It is described in *Practical Lessons in Metal Turning* by the esteemed Percival Marshall.

This book, of which I have a copy of the second edition, was of great assistance to me in my apprenticeship many years ago. I still refer to it at times when thinking out some tricky job that requires much pondering.—E. K. LARKING.

DRYING OUT

Some time ago I decided to build a ship in a bottle as a diversion from more serious modelling. One of the problems to be solved was that of drying out the sea, which in this case consisted of putty mixed with blue oil paint.

After this had been placed in the bottle, the waves formed and an indentation made to receive the hull of the ship, the bottle was set aside to allow the putty to dry. This proved to be a very slow process, condensation soon appeared on the inside of the glass and owing to the lack of circulation the moisture stayed there.

The drying-out process can be speeded up considerably by introducing a current of dry air thus.

Obtain a toy balloon and a length of plastic tubing about ¼ in. dia. and 9 in. long. Blow the balloon up with a bicycle pump using thumb and forefinger as a valve, pinching the neck shut at the end of each stroke.

Insert one end of the plastic tubing in the balloon and the other end well into the neck of the bottle and allow the balloon to discharge therein: this will change the air very effectively.

Carry this out several times a day for four or five days and the putty will be dry enough to proceed with the insertion of the model. Do not blow the balloon up by mouth as the moisture in your breath will impede the drying.—P. TOWNSEND.

Operation RUST

Rust is the enemy of machines. These simple units evolved by EWART E. BLOOR held it at bay

RUST is a very common enemy. I am continually oiling the vulnerable parts of the lathe, though my lathe covers are very good; but I do not think they offer complete protection against rust.

Having been for some years the fortunate possessor of a Myford ML7, it was not until I acquired the Super 7 model that I decided to make a workmanlike job of some lathe bed and chuck rust-protection units. The enclosed drawings and photographs will show quite plainly the very simple way this problem was solved.

The covering for the lathe bed comprises two separate units, one between the headstock and cross-slide, and one between the cross-slide and tailstock.

In order to take measurements of the units, move the tailstock to the end of the bed and the cross-slide about 6 in. along the bed from the headstock. A plain section is made to go between headstock and cross-slide. This is formed from a piece of timber 6 in. × 6½ in. and ½ in. thick.

To this is attached front and back pieces 1½ in. × ½ in., and a centre piece 1¼ in. × 1½ in., all screwed on from the top with 1 in. × No 8 screws. Into the slots formed, glue and copper-tack some mill flannel or felt.

The piece between the cross-slide and tailstock is made of similiar section timbers, except that the top piece is fitted to run past the sides of the tailstock and in between the metalwork on the cross-slide. The front and back pieces are cut and fitted to the top as before and completed by fixing mill flannel, felt or baize.

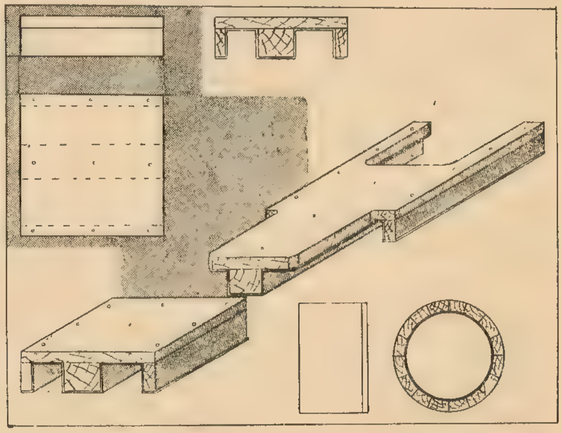
To make the chuck unit, cut out two temporary discs of ½ in. ply or timber to $\frac{5}{16}$ in. larger than the diameter of the chuck. Fit and glue pieces of wood 1 in. × ½ in. around the circumference so that a cylinder is formed. When the glue has dried, clean up with a smoothing plane, cut off the two temporary discs and fit and screw a circular end.

Cut so that it fits over the chuck and jaws, and line with mill flannel as before.

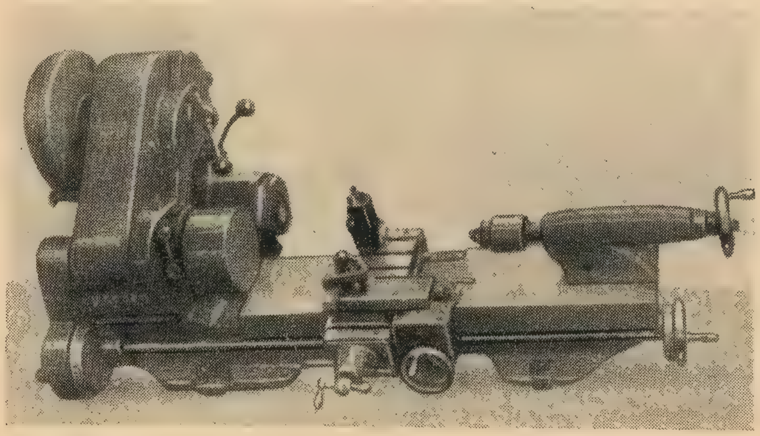
Treat the units with one coat of grey wood primer and two coats of grey enamel to match the colour of the lathe. When paint is dry, impregnate the mill flannel with oil.

After using the lathe, wipe off all swarf and put the tailstock unit into position. Wind the cross-slide along to touch it, fix the plain section into position, and push the chuck unit on. These covered parts will be totally immune from rust. ▣

Right: Sectional and perspective views of the units which protect the bed and chuck jaws



Below: The author's lathe with rust-proof units fitted



EDINBURGH EXHIBITION

THOUSANDS of Edinburgh model railway enthusiasts have been flocking to a fortnight's model engineering exhibition organised by Littlewoods Store in Princes Street.

The exhibition, consisting of more than 200 models, included paintings, coats-of-arms and relics of the pre-grouping days in Scotland.

Most of the models on show were loaned by members of the Edinburgh and Lothian Miniature Railway Club, and the exhibition was opened by Brigadier Sir Eric A. O. Hutchison, the club's president.

Among the models were several made by Sir Eric during the war in the Western Desert. ▣

The mainshaft is supported by tubes in struts and not by plates, as on prototype

THE SHIP AND THE MODEL

Campania

A. E. HUGHES' scale version of the Cunard liner that wrested the Blue Riband from the Americans at the close of the century

THE Cunard Line's *Campania* and its sister *Lucania* were built at Fairfield's in 1893, being commissioned in March and September of that year. The liner *Campania* at completion was the largest (except, of course, for the *Great Eastern*) and fastest ship in the world, measuring 622 ft × 65 ft and attaining a 23 knot speed on the measured mile.

Her two engines each developed 15,000 i.h.p. They were three-crank five-cylinder triples mounting two high-pressure cylinders steeple fashion above the two lows. Engine dimensions were 37 in. × 79 in. × 98 in. × 69 in. stroke. It was 47 ft from the engine bed to the top of the high pressure cylinder.

The *Campania* took the Blue Riband from the Inman Line's *City of New York* by averaging 21 knots on one of her first voyages. The appointments were unexcelled for elegance and employed much lavish panelling in the Victorian style of the era. She presented a handsome appearance and her somewhat oversized funnels (19 ft dia.!) gave her a powerful look. Both sisters were very popular for many years.

The *Lucania* came to an untimely end in 1907 when she was burned out at her pier in Liverpool but the *Campania* was kept in service until just before World War I. She was in the shipbreaker's yard when the war broke out and her useful life was lengthened by being taken into the Navy and rebuilt into one of the first aircraft carriers.

Her bridge and forward funnel were removed and a sloping flight deck was built from near the after funnel to the bow. The uptakes from the forward boiler room were taken to two stacks erected on each side of the flight deck. She continued in this guise through the war and almost came to take part in the Battle of Jutland.

While at anchor in the Firth of Forth during a gale in November 1918 the anchor dragged and before she could be got under control she drifted on to the ram of the battleship *Revenge* and sank in about 10 fathoms of water.

My interest in this particular ship stemmed from a fortunate find, *The Cunard Royal Mail Twin Screw Steamers "Campania" and "Lucania,"* in a secondhand bookstore. It was a reprint of a special issue of *Engineering* from the year 1893. There are about 60 pages of plates, pictures, descriptions of construction and machinery and, most important, an excellent set of builder's plans

PRELIMINARY DESIGN

The scale of the model was determined by two factors—I already owned a steam plant suitable for a model four or five feet long, and also the model would have to be small enough to fit inside the family car. A scale of $\frac{1}{16}$ in. to 1 ft would have produced a 40 in. model which would have been too small for the power plant, while $\frac{1}{8}$ in. to 1 ft would have made a 6 ft 6 in. model, which would have been too big for the back seat of the Ford.

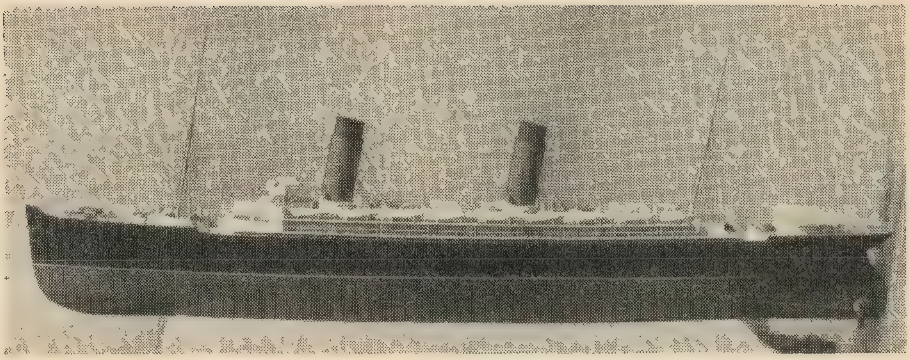
Therefore, a compromise of 3/32 in. to 1 ft was chosen, and this satisfied all requirements and gave a hull length of 4 ft 10 in. with a displacement of 35 lb.

I was anxious to keep the ship exactly to scale, especially above the waterline, and knowing that in a model extra displacement is usually necessary, I was faced with the problem of getting displacement and stability in a hull restricted to a 6 in. beam. The only thing to do was to increase the draft for added displacement, which would make a very top-heavy model, and then provide a quantity of ballast with a very low centre of gravity.

Without the knowledge to figure it out mathematically, I increased the draft by guesswork from about $2\frac{1}{4}$ in. to $3\frac{1}{4}$ in. and luckily this proved to be just about right. I expected to use an external lead keel to provide stability but as it turned out a 7 lb. lead fin was necessary. This extends 3 in. below the bottom of the ship in much the same manner as the conning tower of a submarine extends above the deck.

This may not be true to form but I believe that any loss of realism by use of the fin (which is, of course, invisible when in the water) is more than offset by the fact that above water the model is true to scale in every respect with not the slightest departure from the form of the original *Campania*.

With the length, beam, and draft determined, a hull plan half-size was drawn up, using the deck plans of the original ship and such frames as were shown to work up the lines. From



Side view of CAMPANIA *showing the clean lines of the vessel's hull*

the plans in the book, photostats were made up and enlarged to one-third the size of the model. While building the model all dimensions were taken by a pair of draughtsman's dividers and stepped off three times to get the full size.

BUILDING THE HULL

The hull is made up of eight pine "lifts," $\frac{3}{4}$ in. thick, in the standard bread-and-butter fashion. The lifts were first assembled into two dowels near the ends, centre lines laid off, then the lifts separated and the hull lines drawn on each lift. Each lift was then bandsawn right to the line and when reassembled and glued the dowels located the whole in perfect alignment.

When shaping the hull, the wood was taken down until the corner formed by the edge of the lift, and the lift above, was reached. This makes it necessary to use comparatively few templates but still ensures an accurate hull. A hull thickness of $\frac{3}{8}$ in. was made with a cross brace one-third the hull length from the bow and another one-third from the stem to stiffen the sides a bit.

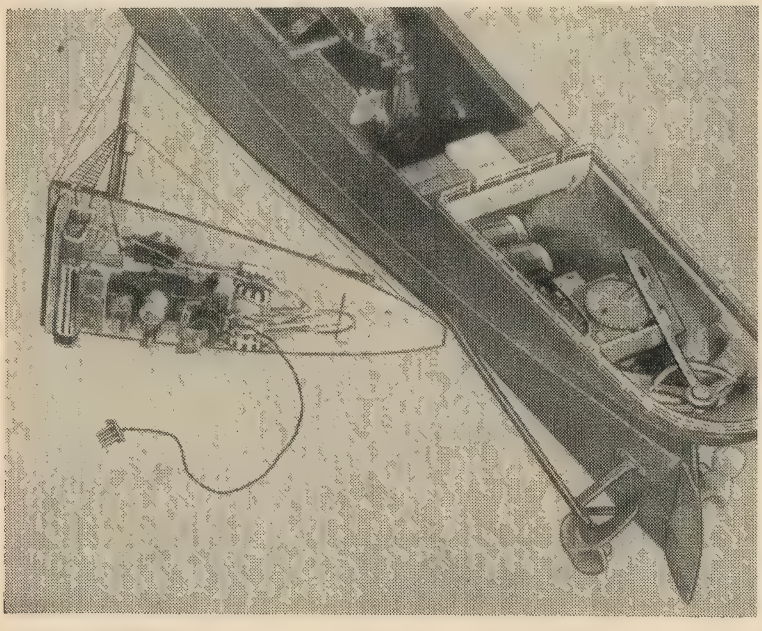
A brass shoe of tapered cross-section was fitted over the stem to take the shock of the inevitable collisions with driftwood, other models, fish or sitting ducks.

MACHINERY

The engine and boiler are a commercial product from a well-known pre-war British firm. The engine is a two-cylinder single-acting trunk type with a bore of $\frac{7}{8}$ in. and a stroke of $\frac{3}{4}$ in. The boiler is a standard launch type centre flue boiler of 4 in. dia. and 8 in. length. Actually this plant is more than adequate for attaining the scale speed of two knots. There is plenty of power in reserve, and, if needed, we could make it from Ambrose Light to the Needles in a little over two days !

The engine is mounted in line with the starboard shaft and is coupled direct. The power for the port shaft comes from a $2\frac{1}{2}$ in. gear just aft of the shaft-coupling, which drives another $2\frac{1}{2}$ in. gear on the port shaft. Propellers are $2\frac{1}{2}$ in. dia. The usual boiler fittings are installed—water glass, pressure-gauge, safety-valve, displacement lubricator and stop valve. Combustion gases pass up an inner funnel in the after stack.

The forward deck turned over to show receiver



After completing the hull and installing the machinery, it was decided to hold some preliminary trials before building up the superstructure. A temporary deck was fitted over the whole model to keep unwanted draughts from bothering the fire which at the time was provided by the gasoline blowtorch that came with the rest of the steam plant.

The ship was launched, steam raised and the engine warmed up. Everything looked in good order and to be working smoothly. The temporary deck was dropped in place, the throttle opened, and *Campania* set off across the pond. The other side was reached uneventfully and the model was started off on the return trip.

Then disaster struck. After a run of 100 ft or so the ship began to slow down, and by the time the halfway point was reached there was hardly any steerage. From the deck over the fire room appeared a wisp of smoke followed a moment later by a flicker of orange flame.

There was no boat in which to rush to her aid and the water was much too cold for swimming, so *Campania* crept across the pond, smoke and flame billowing from the stoke hold. Steam was being generated solely

by the flaming interior, the treacherous blowtorch having gone out. After an eternity she reached shore with the engine barely ticking over. Water was hastily splashed aboard to stop the conflagration.

Had the superstructure been completed it would surely have burned out but, as it was, only the temporary deck was destroyed and the sides of the fireroom charred to a depth of $\frac{1}{8}$ in. This was later scraped down and repainted. The cause of the fire was never fully determined, but the gasoline blowtorch was exiled and the model is now fired by a propane blowtorch which burns bottled gas.

This has been found to be completely reliable and reduces the fire hazzard almost entirely. It is also a very simple device to operate and all that is required is to turn the valve and apply a match. This eliminates much of the bother at pondside that is encountered in getting a gasoline torch started.

SUPERSTRUCTURE

The superstructure between the forward and after well-deck lifts off in one piece right down to the main deck. This leaves the model open for almost two-thirds of its length and gives easy access to all machinery spaces.

The decks and deckhouse are fabricated of $\frac{1}{8}$ in. thick pine boards. Ventilators and boats were carved from solid blocks of pine, it being felt that to carve the 24 boats and 32 ventilators was quicker than using electroplating or any other methods of mass production. The stacks were made from tin cans with the bands and exhaust pipes soldered on.

Davits are $\frac{1}{16}$ in. dia. iron wire, the railings being built up in place by soldering brass wire to stanchions made from common pins. A few items such as winches and anchors are white metal castings purchased from a model supply house, but these are few, primarily because of the weight that white metal fittings add.

RADIO CONTROL

The model is steered by radio control which adds much to the pleasure of sailing. As with the main engines, the transmitter and receiver were bought ready to install (they are of Japanese manufacture and have never failed to send and receive a pulse !) but the rudder servo unit was built up from a small 3 v. motor, a train of gears from an electric clock and a few items from a bombsight.

The radio receiver is fastened to the underside of the fo'c'sle deck with an aerial running up the after side of the foremast. The deck with radio and batteries lifts off in one unit for servicing. A pair of wires runs from the receiver down the length of the engine compartment beneath the poop deck where the servo unit and its batteries are located.

A pulse from the receiver relay starts the servo motor. After the rudder quadrant rotates about 10 deg. a limit switch is closed which keeps the servo going until the quadrant turns through 90 deg. when a projection on the quadrant opens the switch to stop the rudder at hard over.

It is only necessary to send a brief pulse to get the servo turning and then it continues on its own until the rudder is hard over or centred as the case may be. The steering is limited to a left, centre, right, centre sequence, but I am working on a clockwork escapement to add into the circuit which will then give left or right rudder as desired and also proportional control if I like.

Since completion the model has been run successfully on numerous occasions and has had no further trouble from machinery failure. At cruising speed the model will run for 25 min. before it is necessary to stop to add feed water.

The tank of propane gas is good for three or four hours. There is just one thing that could add to the realism of the model; there should be clouds of black coal smoke coming from both stacks but no practical way of doing this has yet come to my attention. ■

Helicopter view of CAMPANIA, *showing the trim line of lifeboats*

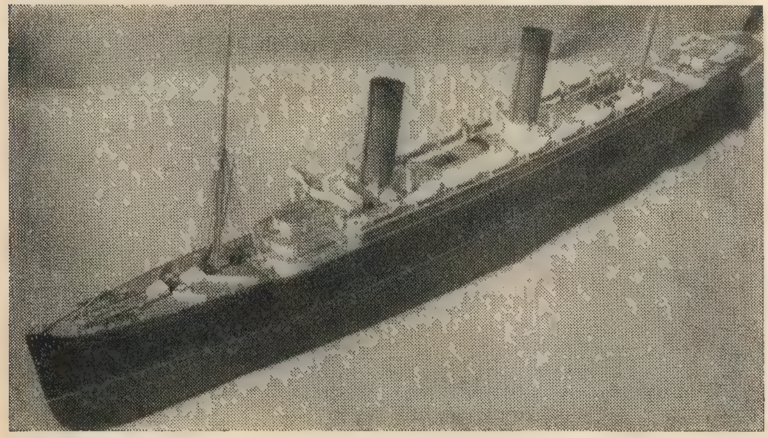


PHOTO FAIR 1957

BRING YOUR OWN CAMERA

SIXTY exhibitors will be displaying equipment worth more than £3 million at the Second Bi-annual Photo Fair to be held in the National Hall, Olympia, for a week commencing April 11.

Several leading national organisations, including the Royal Photographic Society, Institute of British Photographers, Master Photographers' Association and the Wholesale Photo Finishers' Association, will give examples of the development of photography in their own particular fields.

Visitors are invited to bring their cameras and take part in the photographic competition which will be free of charge. Some of the country's leading models will attend to be snapped in connection with the competition.

Other attractions will include a large marine tank peopled by "mermaids" whose graceful aquabatics may be captured on the emulsion by visitors. ■

HUBER, NOT HUMBER

We regret that in the article "Some Further Notes on the American Traction Engine" [MODEL ENGINEER, 21 March 1957] the name of the American firm producing return-tube boilered traction engines was given as Humber. It should, of course, have been the HUBER Manufacturing Co.

VIRGINIA

As the wooden-beamed brake gear on the tender of the full-size old timers is unsuitable for reproduction in 3½ in. gauge, L.B.S.C. describes a working modification which retains the original characteristics

The brake gear fitted to the tenders of *Virginia's* full-size relations was a really nobby box of tricks, reminiscent of the brakes on the old horse-drawn tramway cars.

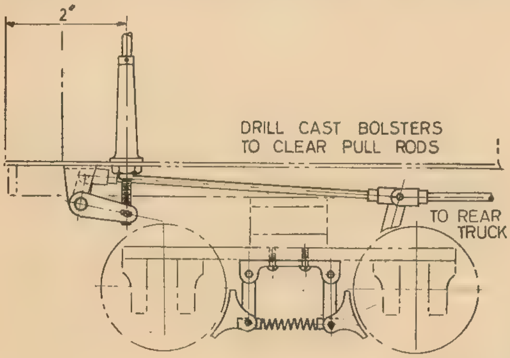
The brake shoes were cast with three openings in each, like miniature wheel spokes, and were supported on each end of a huge wooden beam reinforced by tie-rods. These were hung from brackets bolted to the centre part of the tender truck frames—two beams per truck—and the compensating gear was arranged diagonally, the upper end of each actuating lever being inclined toward the left side of the tender. These ends were connected by a long pull-rod which extended toward the front end of the tender, terminating in a length of chain which was wound around the lower end of the brake spindle. The upper end of this carried a large ratchet wheel level with the tank top.

A hand-operated pawl, pivoted to the tank top, engaged with the ratchet teeth. To apply the brake the fireman had to wind up the chain by aid of the cow's horn handle, and to hold the brakes in the "on" position he had to knock the pawl into engagement. But how he did this with both hands gripping the brake handle history doesn't tell us.

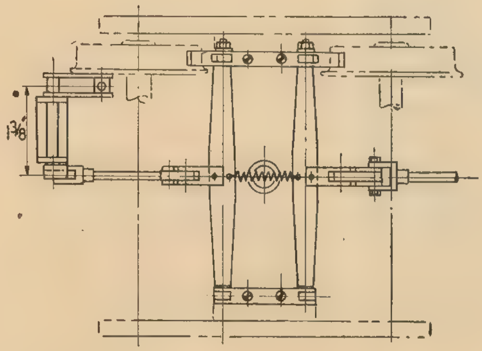
This arrangement would be useless as a working proposition on a 3½ in. gauge job, so I have had to rearrange it. However, I have retained the general characteristics. Solid brake blocks are used, with slotted backs to accommodate the hangers which are slung from brackets bolted to the centre part of the truck. The beams are of steel bar, with turned-down ends which serve as brake-block pins. A fork is attached to the centre of each beam; the front-end one carries the compensating lever, the upper end of which is anchored to a bracket also screwed to the truck centre. The back-end one carries the longer actuating lever. These two levers are connected near the bottom by a torque-rod with a fork at each end for attaching to the levers.

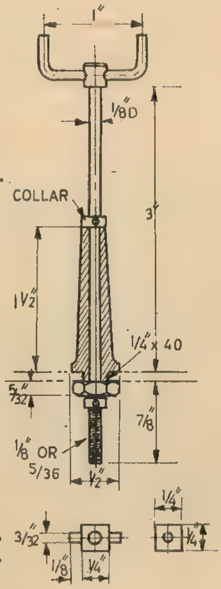
The upper ends of the actuating levers are coupled together by a long pull-rod. Another pull-rod goes from the front one to a vertical arm on a brake shaft which is worked by a vertical brake spindle. It is screwed at the bottom to engage a nut which works between two horizontal arms at the end of the brake shaft. The latter is supported by a sheet-metal bracket attached to the underside of the soleplate.

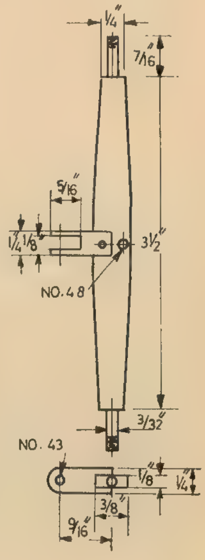
The action is as follows: When the brake handle is turned clockwise the nut rises and pulls up the horizontal arm on the shaft, causing the vertical arm to move forward. This pulls the actuating arm on each truck towards the front of the tender, and the torque-rod at the lower part then pushes the front beam forward, applying the brake to the front wheels of the truck. When the torque-rod can move no further the rear end of it becomes a fulcrum for the actuating lever, the lower part below the torque-rod fork moving backwards. This takes the beam with it and thus applies the brake to the rear truck wheels.



Left: Arrangement of the brake gear and, below, the underside of the gear







Right: The brake column and the brake beam

When the brake handle is turned the other way the action takes place in reverse, and the springs which connect the beams pull the blocks clear of the wheels. No ratchet gear or chain will be needed as the nut cannot slip on the screw.

BRAKE BLOCKS, HANGERS AND BRACKETS

It is possible that cast-iron brake blocks will be available, with the slots for hangers cast in. If so, they will only need a slight clean-up with a file and drilling for the ends of the beams, which take the place of the usual hanger pins. The blocks can also be cut from mild-steel bar of $\frac{1}{4}$ in. × $\frac{5}{8}$ in. section, the slots being formed by the same method as used for slotting forks. File the end of the piece of bar to the shape of the back of the block, then clamp under the slide-rest toolholder and slot it with a $\frac{1}{8}$ in. saw-type cutter mounted on a stub arbor in the chuck. Saw off sufficient to allow for the radius, then repeat operations until you have eight blocks.

To form all the radii at one fell swoop scribe a circle 2 in. dia. on a piece of brass about $\frac{1}{8}$ in. thick. Solder all the blocks to this, with the edges to be radiused, touching the circle. Bolt the assembly to the face-plate with the circle running truly, then put a boring tool in the slide-rest and proceed as if you were boring an eccentric-strap. Melt the blocks off the plate, wipe off any superfluous solder, and there are your finished brake blocks. The hangers are filed up from $\frac{1}{4}$ in. × $\frac{1}{8}$ in. mild steel and need no detailing.

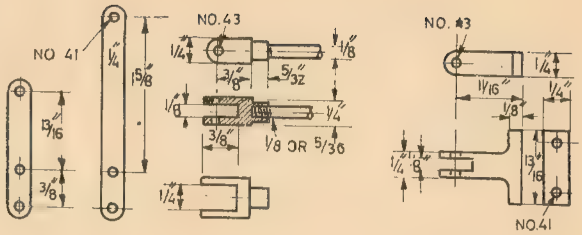
The hanger brackets can be made from $\frac{1}{4}$ in. × $\frac{3}{8}$ in. rod, brass or steel. Each pair is in one piece, $1\frac{5}{8}$ in. long. Slot the narrow edge $\frac{1}{8}$ in. wide and $\frac{1}{4}$ in. deep by the method described for slotting crosshead shoes and similar jobs. File to the shape shown and drill for pins and fixing-screws, then put the hangers in the slots and secure with pieces of 3/32 in. silver-steel or 13-gauge spoke wire driven through the lot and filed flush each side.

The hangers should be free to swing. Each bracket is attached to the underside of the truck frame, level with the centre line of the wheel treads, and secured by two 6 B.A. or 4/36 screws run through clearing holes in the bracket into the tapped holes in the truck frame.

BRAKE BEAMS AND COMPENSATING GEAR

The brake beams are made from $\frac{3}{8}$ in. × $\frac{1}{8}$ in. mild steel, each needing a piece a full $4\frac{3}{8}$ in. long. Chuck truly in the four-jaw and turn down $\frac{7}{16}$ in. of each end to 3/32 in. dia., screwing 3/32 in. or 3/48 just far enough to leave a full $\frac{1}{4}$ in. of "plain" between the thread and shoulder. The distance between the shoulders should be $3\frac{1}{2}$ in. File to the shape illustrated.

The levers, forks and bracket



The forks for attachment of the levers are made from $\frac{1}{4}$ in. square steel. Each is $\frac{3}{4}$ in. long, one end being slotted, drilled and rounded off just like a valve-gear fork. The other end is slotted at right angles and to $\frac{3}{16}$ in. depth; this end is fitted to the brake beam, pinned to hold it in place, and then brazed. Opposite the fork drill a No 48 hole in the beam for the end of the pull-off spring.

Both actuating and compensating levers are filed up from $\frac{1}{8}$ in. × $\frac{1}{4}$ in. mild steel and drilled as shown. A bracket is required to hold the fulcrum pin which supports the upper end of the compensating lever. This is sawn and filed from $\frac{1}{4}$ in. × $\frac{7}{8}$ in. mild-steel bar to the shape and dimensions given in the detail illustration. Alternatively, it could be built up, the forked section being made from $\frac{1}{4}$ in. square steel and the end piece from $\frac{1}{4}$ in. × $\frac{1}{8}$ in. steel, the two parts being temporarily screwed together and the joint brazed. The bracket is attached to the centre of the truck frame by two 3/32 in. or 3/48 screws (see drawing of the compensating gear). The torque-rod is a piece of $\frac{1}{8}$ in. round steel, with a fork made from $\frac{1}{4}$ in. square steel screwed on to each end.

The assembly and erection are very simple. Pin the middle hole in the compensating lever to one end of the torque-rod and the actuating lever to the other by pieces of 3/32 in. silver-steel or 13-gauge spoke wire pressed through holes in the forks and levers, and filed flush outside. The pins should be a press fit in the forks and free in the levers, but if they are at all slack in the forks rivet the ends over just sufficiently to prevent their coming out. Put the top of the compensating lever in the slot in the fulcrum bracket and pin that too. The lower ends of both levers may then be attached to the forks on the brake beams, either by pinning as stated or by little bolts made from 3/32 in. silver-steel or 13-gauge spoke wire screwed and nutted at both ends.

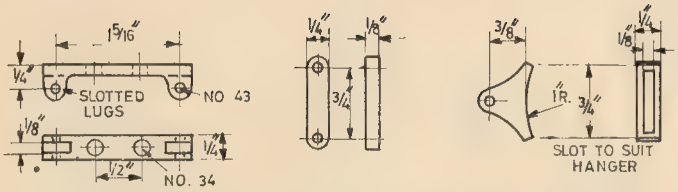
The assembly should then present the appearance shown in the drawing of the compensating gear. To erect, all that is needed is to screw the fulcrum bracket to the centre part of the truck frame. The rear tender truck is furnished with an exactly similar assembly.

The final job is to put a brake block on the end of each hanger, lining up the hole in the hanger with those in the block; then slide the lot into position, with the screwed ends of the brake beams going through the holes in the brake blocks and hangers. Attacl the hanger brackets to the truck frame and put nuts on the projecting ends of the turned-and-screwed parts of the beam outside the blocks. When these nuts are tight the blocks should be free enough to adjust themselves to the wheel treads, but not slack enough to lop over and rub against the wheel treads when the brakes are off.

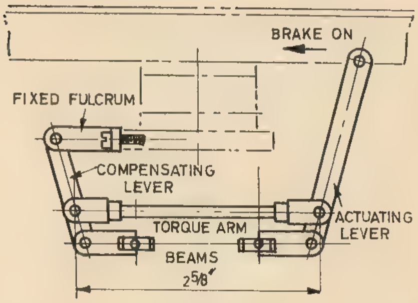
An alternative way of assembling, which doesn't involve interfering with the springs and equalisers, is to attach the block-and-hanger assemblies to the beams before screwing the fulcrum bracket in place. If the truck is laid upside-down on the bench a little judicious jerrywangling will get the whole issue into place, and it will only need the screws putting into the brackets to keep it there. Connect the two beams by a pull-off spring wound up from about 20-gauge tinned steel wire around a piece of $\frac{1}{8}$ in. rod and looped through the holes in the beams. If the top of the actuating lever is moved in the direction of the arrow, both pairs of brake blocks should press evenly against the wheel treads, releasing immediately the lever is let go. Don't forget to " ile the jints " as one of my early footplate mates used to say; but keep the " ile " off the blocks and wheel treads !

BRAKE COLUMN AND SHAFT

The brake column and shaft, being self-contained items, can be used on both the ancient and modern types of tender. The arrangement illustrated here is for the old one. To



Above: The hanger support, hanger and brake block



Right: The compensating gear

make the column chuck a piece of ½ in. round rod (brass or steel as preferred) in the three-jaw, face the end and drill as deeply as you can with a No 30 drill. Turn a bare ¼ in. length to ¼ in. dia. and screw ¼ in. × 40; part off at 1½ in. from the shoulder. Reverse and rechuck in a tapped bush held in the three-jaw. Centre the other end and drill down with a No 30 drill until you meet the previous one. Bring up the tailstock with a centre-point in it to support the job while the column is turned to the shape illustrated. The exact angle of taper doesn't matter a bean, but leave a full-diameter flange at the bottom. Then make a ¼ in. × 40 locknut to fit the screwed part.

The brake spindle is a piece of ⅛ in. steel rod 4¼ in. long, with ⅝ in. of ⅛ in. thread at one end. A little boss turned from ¼ in. rod is screwed or pressed on to the other end and a No 49 hole drilled through the lot, into which is squeezed a 2 in. length of 15-gauge spoke wire. Bend up both ends of this to form the cow's horns, and round off the ends so that the fireman won't cut his hands on them. Incidentally, the handle on the modern tender should have only one end turned up.

Make two collars from round rod; one ¼ in. dia. and the other a bare 7/32 in., drilling both No 31. Push the ¼ in. one on the spindle just over halfway up, insert the spindle into the column and put on the other collar just above the end of the thread. Bring down the upper collar until it touches the top of the column, leaving the spindle just free to turn, then pin both collars in position with bits of thin wire, such as domestic pins, which will not weaken the spindle. Drill a ¼ in. clearing hole in the soleplate, 2 in. from the front end and 1⅜ in. to the left of the centre line, insert the screwed end of column and secure with the locknut.

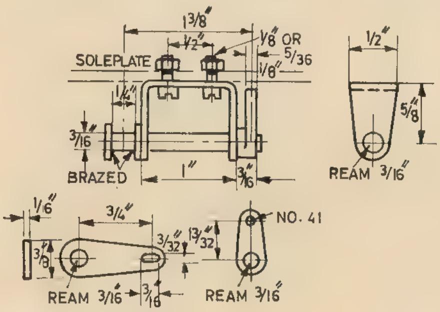
The bracket carrying the brake shaft is bent up from a piece of 16-gauge steel, ½ in. wide and about 2¾ in. long. If bent over a piece of ⅞ in. bar it will come out just the right size. Round off the sides with a file and drill a No 14 hole in each, ⅝ in. from the top, then put a 3/16 in. parallel reamer through the two of them at once. These holes may be drilled larger and bronze-bushed if desired. (I don't consider this necessary as the brakes are for ornament only and the tender is too light to render it of any use for service stops.) Drill two No 30 screw-holes on the centre line between the sides.

The brake shaft is a piece of 3/16 in. round steel a full 1⅝ in. long. One end carries two horizontal arms which are brazed to the shaft with the brake nut between them. The arms are filed up from 16-gauge steel, the large end being drilled No 14 and the reamer being inserted only just far enough to make the hole a press fit on the shaft. For the nut chuck a piece of ¼ in. square bronze rod truly in the four-jaw, face the end and turn down a bare ⅛ in. length to 3/32 in. dia. Part off at ⅜ in. from the shoulder, reverse in the chuck and turn a similar pip on the other end. Drill the block No 40 and tap to suit the brake spindle. Squeeze one arm on the shaft to 5/16 in. from the end, then the other on the extreme end with the nut between, the pins working in the slotted holes as shown in the general arrangement drawing. Then braze or silver solder the arms to the shaft, and be sure that they are in alignment.

The other end of the shaft carries a lever to which the pull-rods are connected; this is made exactly similar to those on the rocking-shafts of the valve gear and all the dimensions are given in the drawing. The boss should be reamed a tight fit for the shaft. Push the shaft with the horizontal arms attached through the holes in the bracket, put on the bossed arm at right angles and pin it with a bit of 1/16 in. silver-steel or 16-gauge spoke wire.

The easiest way to locate the assembly for erection is to hold the nut against the bottom of the brake spindle and turn the handle until the long arms are lying horizontally while the top of the bracket is tight up against the soleplate. Then set it so that the brake shaft is at right angles to the centre line of the tender (see underside view) and the pins or trunnions on the nut are at the end of the slot nearest the shaft.

With a bent scriber mark off two circles on the underside of the soleplate, through the holes in the bracket; swing the latter out of the way, drill two No 30 holes in the soleplate at the marked places, scrape off any burrs, swing the bracket back and secure it with two ⅛ in. or 5/36 screws and nuts. When the handle is turned the nut should run quite freely up and down the screw, operating the shaft easily.



The brake shaft

THE PULL-RODS

The front pull-rod is merely a piece of ⅛ in. silver-steel or drill rod (better than mild steel for this purpose) approximately 4⅜ in. long, screwed at each end and furnished with a couple of forks or clevises. The exact length of the finished pull-rod between the centres of the holes in the forks is obtained from the actual job. Screw up the brake nut until it is about ⅛ in. from the collar and push the top of the actuating lever on the leading truck in a forward direction until the brakes are hard on.

(*Continued on page 549*)

Steaming a veteran FIRE-ENGINE

R. W. FENWICK describes an historic event

A SHORT WHILE AGO a Shand Mason steam fire-engine was lent to the Berkshire and Reading Fire Brigade on permanent loan by the kind permission of the Lord Lieutenant of the County of Berkshire, Mr Benyon, from his estate at Englefield near Reading.

The engine looked in perfect condition, although it had last been in steam about 11 years ago. After a few weeks of cleaning it was decided to see if it would work under steam. I gave the engine a close examination while cleaning it and found that all the steam cocks were free but the water cocks had seized up so these were taken down and freed.

The engine could be turned over by hand but the wick oilers for the glands had hardened and were incapable of passing oil; these were left and the glands were oiled by hand.

As the last steamer in this brigade had gone out of service many years ago, the steam cylinder oil required had to be obtained from an outside source. The internal condition of the steel boiler was not known so it was decided to keep the boiler pressure low while the engine was working.

With the company of several officers and men of the brigade, a start was made to steam the engine one Sunday morning. The filling plug at the side of the boiler had seized so the boiler was filled by connecting a wash-down hose to the mechanical boiler feed-pump pipe. The boiler was filled to capacity and the blowdown valve opened. A quantity of sediment was expected to come out but practically none came.

The water level was brought down to the high mark on the twin gauges, the cylinder oilers removed and filled and a small amount of oil poured in the cylinders; also the sight feed lubricator which fed direct into the main steam-pipe was filled, the road wheels soaked with water and a supply of coke made ready.

The main stop-valve was cracked open to enable warm air to pass through and warm up the cylinders while raising steam. The gauges and cocks were tested again and then the fire, which, incidentally, had been laid for 11 years, was lit.

The fire soon burnt up and in about 10 minutes 10 lb. pressure was showing on the gauge. The main stop-valve was closed and the water gauges blown down and some sediment came away. The twin safety-valves have test levers by which the valves can be lifted to test for free working, so the valves were tested frequently.

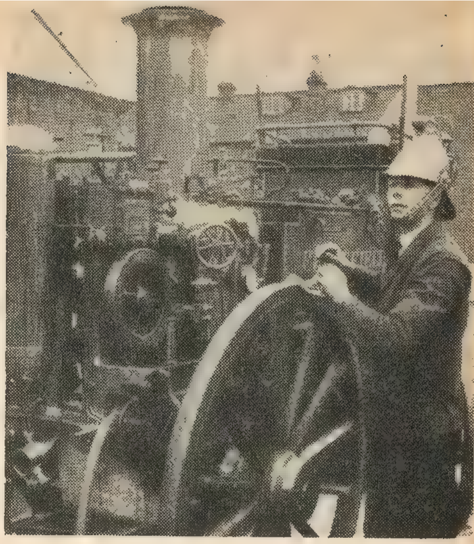
The suction and delivery hose had already been connected up to the main pump via suitable adaptors to suit the V-type of thread, the suction strainer being dropped into an underground tank.

Then came the great moment. The cylinder drain and steam-chest cocks were opened, the main valve cracked open (by then 15 lb. of steam was showing) and the engine started at once and ticked over steadily with no steam or water leaks. The whistle was blown, the cylinder drains closed and the engine settled down nicely. Finally the sight feed lubricator was adjusted.

By now the boiler was making steam fast and the pressure was rising rapidly, this being without the use of the blast-pipe throttle and using burning coal which was laid 11 years ago. So the twin injectors were turned on—they took water from a small side tank—the firedoor was opened and one or two holes pricked in the fire bed. This brought the pressure down to about 25 lb.

With the excitement of the engine running the fact that it was not pumping was overlooked. It was discovered then that there was an air leak in the suction hose. By this time the boiler needed filling again but it was found that the injectors would not work properly on the low steam pressure, so as the water was low in the glass the engine was stopped, the fire partially drawn and the wash down hose connected up again. The boiler was slowly filled, the blower turned on and soon the engine was running again.

With the defective suction hose the pump would not lift water, but the suction was connected to a hydrant and then the pump boosted the water from the hydrant, and by adjusting the feed-pump supply, which came from the water being pumped, the boiler was kept filled. The steam pressure was never allowed to rise above the low pressure of 25 lb. and this, of course, affected the pressure of water being pumped.



Above: The author, complete with old-time head dress, at the controls

Below: The engine pumping under the conditions described in the article

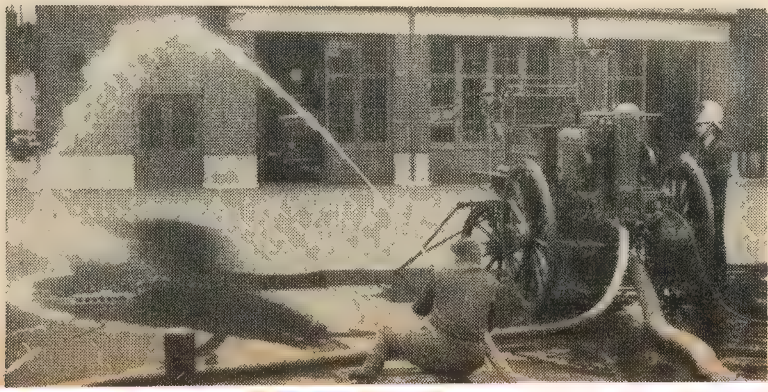
So for two hours while many photographs were taken the old steamer pumped away with many blasts from her whistle and a steady "Ponk ! Ponk ! Ponk !" from her exhaust;

And so the time came to stop her. While she had been in steam the fire had not been made up and the reserve fuel was unused. The fire was drawn, the engine was allowed to run itself out and the boiler was then blown down and all cocks left open and the engine cleaned and oiled.

In my spare time I am now thoroughly cleaning the engine and the paintwork is being touched up ready for any future displays or exhibition.

Brief particulars of the engine are: built by Shand Mason and Co., in May 1894 for a price of £661 10s., including all appurtances. Indicated horsepower 30; twin cylinders 6 in. bore × 6 in. stroke; pumping capacity 350 g.p.m.; fitted with two Gresham and Craven injectors and feed from main water pump; two water gauges; two safety-valves; sight-feed displacement lubricator; steel boiler with brass cross tubes and plain valve gear.

It was built to run at 120 p.s.i., that pressure could be raised in 5½ min. It assisted Reading Fire Brigade at several fires in 1895 and 1905. ■



An automatic pressure control switch

J. H. TURNER devised this simple but effective unit which will control the output of the workshop compressor

A SOURCE of high-pressure air is a most useful asset and many home workshops must now be so equipped, using the very reasonable compressors available on the surplus market. Whether the few workshops that I know personally are representative of the majority is, of course, impossible to say, but it has been my experience that while the nature of most of these compressors renders the fitting up of filters, water separators and the rest a necessity, there is a marked lack of effective pressure-control switches, the usual cry being that they are too expensive to buy, too difficult to make properly or just not worth the bother !

Now one of the most annoying things that can happen in a small workshop is to have the cylinder head blow off or the air container burst just at the crucial point of that special spray job or delicate brazing operation. These processes require concentration, confidence in the equipment and a steady air pressure, none of which can be achieved if it is necessary to keep switching the motor on and off all the time.

Clearly, no compressor can be considered complete and fully effective without an automatic pressure-control switch, preferably one which is: (*a*) very sensitive (i.e., small pressure difference between on and off); (*b*) accurate and consistent; (*c*) easy to adjust over a wide range; (*d*) easy, quick and cheap to make; (*e*) leak proof; and (*f*) small and compact.

Easy to adjust

The one about to be described can be set to operate consistently on a pressure difference of 4 lb. and it can be adjusted in a couple of minutes to operate anywhere between 10 p.s.i. and 100 p.s.i. Here be it noted that 85 p.s.i. is the maximum *safe* pressure for a single-stage compressor, regardless of what yours will pump up to !

It can be made out of scrap in a weekend by anyone who can cut a thread on a lathe and it requires no tolerances better than an easy 10 thou. It cannot leak, and it measures only $2\frac{1}{2}$ in. × 3 in. × $1\frac{1}{4}$ in.

Three examples have been made over the last few years and the original is still controlling a 5 h.p. commercial installation in constant use. The other two are controlling a $\frac{1}{2}$ h.p. and a $\frac{1}{4}$ h.p. motor respectively, both without starters but both accurately fused.

The drawings are largely self explanatory and it has not been considered necessary to detail every component. The apparent complexity of the main assembly, shown twice full size in cross section, will resolve itself with study, but to assist in this and perhaps provide a little interest a suggested method of making this unit follows. It is strongly recommended that non-ferrous metals of the specified sizes be used here, but for the rest of the components both materials and sizes can be varied to suit the contents of the scrap box.

PRESSURE SENSITIVE ELEMENT

Take a $1\frac{3}{4}$ in. length of $\frac{3}{4}$ in. hexagon brass bar, face, centre and drill $\frac{1}{8}$ in. to about $\frac{3}{4}$ in. depth. Open out with a $\frac{1}{4}$ in. drill to $\frac{9}{16}$ in. depth and then with a 13/32 in., or your nearest smaller drill, to $\frac{1}{2}$ in. depth. Bore out to tapping size for $\frac{1}{2}$ in. B.S.F. (end of taper tap should just enter) and face off the internal shoulder to a depth of $\frac{1}{2}$ in.

Screwcut the thread to a depth of $\frac{5}{16}$ in. full, preferably pulling the lathe belt by hand or at least taking great care not to have a dig in at the end of the hole, and finish with a plug tap. Skim out any burrs thrown up at the start of the untapped part of the hole.

Reverse the workpiece in the chuck, face, centre and drill right through $\frac{1}{16}$ in. Turn down to $\frac{3}{8}$ in. dia. for a bare inch and then reduce the first $\frac{5}{8}$ in. of this to suit the internal bore of the pressure tubing you are using. Put in three or four shallow grooves as shown, with an external screwcutting or chamfering tool set round in the toolpost, and put as many threads on the remaining $\frac{3}{8}$ in. portion as a $\frac{3}{8}$ in. B.S.F. die will allow. This completes the body.

Take an inch or two of $\frac{1}{2}$ in. brass bar, or slightly larger if your chuck is badly out, face, centre, drill right through, using your favourite method for getting a true hole, and finish with your drill nearest under $\frac{3}{16}$ in. Ream $\frac{3}{16}$ in., open up the hole with a $\frac{5}{16}$ in. drill to a depth of $\frac{1}{16}$ in. full, turn down about $\frac{1}{2}$ in. of the bar until it is an easy sliding fit in the large hole in the body and part off a $\frac{1}{16}$ in. ring from the end.

Face the end, or cut back the shoulder as necessary until the reduced end is $\frac{1}{8}$ in. long, and take a light skim off the larger diameter. Put on about $\frac{1}{2}$ in. of $\frac{1}{2}$ in. B.S.F. thread using a tailstock die-holder (probably scoring the smaller diameter, but no matter) and part off to a bare $\frac{1}{2}$ in. overall length, chamfering the sharp end of the thread before parting is complete. Put a screwdriver slot across the large end.

Finally, take a piece of bar which will not go through the thin ring already made and turn down about an inch length to an easy slide fit in this ring. Without removing from the chuck, turn down an $\frac{11}{16}$ in. length to an easy slide fit in the $\frac{3}{16}$ in. reamed hole already made and part off to leave 1/32 in. of the larger diameter.

Clean off the parting pip and put a sawcut $\frac{1}{16}$ in. wide and $\frac{1}{16}$ in. deep in the middle across the face of the small end, cutting the ends deeper than the centre to give a roughly circular form to the bottom of the slot as indicated in the drawings.

Assemble the components without the rubber disc and check that the plunger will move crisply under its own weight. If not, ease as necessary, but *do not lubricate*.

Make a punch to cut the rubber disc truly circular and an accurate fit in the recess, but do not use anything thicker than bicycle inner tube. Assemble completely, the screwed plug needing to be a little more than finger tight. The plunger may now appear not to move at all, which is quite in order and in fact desirable for the sensitive operation of the device.

PRELIMINARY ADJUSTMENTS

The rest of the components are straightforward and if a suitable spring is not to hand it can be wound up from 22-gauge spring-steel wire on a $\frac{1}{8}$ in. rod as a former. The switch itself is a small micro-switch, readily and cheaply available on the surplus market, and it is advisable not to drill the mounting plate for

this component until all the rest of the pieces are made and assembled, then proceed as follows.

Tension the spring enough to hold the components firmly in place and adjust the screwed rod until the operating bar is parallel with the base. Offer up the micro-switch backed with suitable packing to bring the button under the operating shoe and move it towards the shoe until the contacts are just on the changeover point—identified by a clearly audible click. Mark this position and mount the switch.

Adjust the effective length of the pivot pillar by means of the two nuts until the switch is just, but only just, in the "not operated" position, i.e., the "normally closed" contacts are closed. Tighten up the spring by about half the available thread and if this does not cause the contacts to click over adjust the pivot column again by the absolute minimum required to do so.

CONNECTING UP

The complete unit is best mounted in a vertical position on a convenient part of the compressor and should be connected to the system on the compressor side of the first filter with a short length of pressure tubing.

If the motor is to be controlled direct without a starter, it is well to introduce a special fuse just large enough to carry the starting current of the motor for the very short time needed.

This fuse should be in the live line to the motor as should the normally closed contacts of the micro-switch, and of course the whole works should be adequately earthed, with bell wire if you like, but with enough strands of it to equal the current-carrying capacity of the leads to the motor. You can use a fuse in each of the power lines to the motor, in which case the earth line need be little more than twice the size of the fuse wire.

FINAL ADJUSTMENT

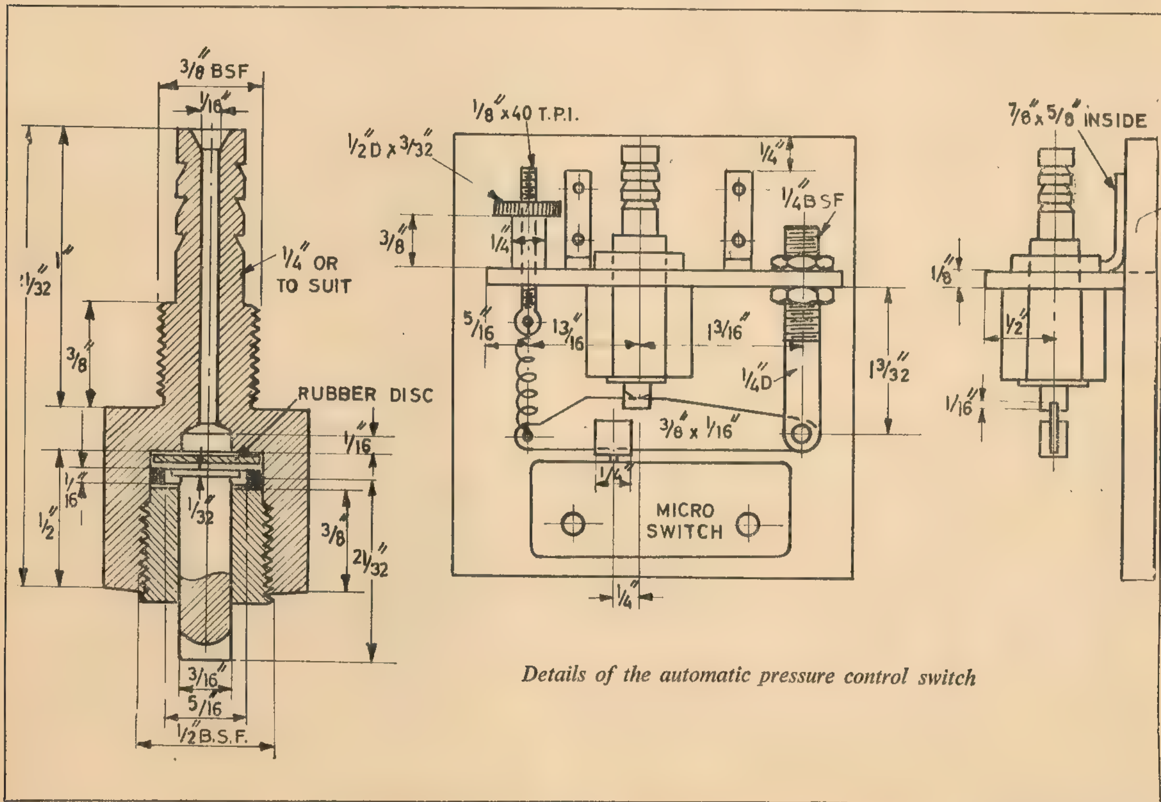
Now to see if it works, that wonderful and ever-fresh thrill that can only come to a man who has made something with his own hands! Well, slack off the tensioning spring, switch on at the main switch and watch the pressure gauge. When the micro-switch operates, tighten up the spring until the motor starts again and proceed in this way until the switch operates somewhere near the desired pressure.

Adjust the pivot column until the motor starts again, this apparently unnecessary procedure serving the most important purpose of achieving maximum sensitivity. Final adjustment of the spring tension to give the exact operating pressure required completes the setting up.

If it is subsequently desired to set the unit up for a pressure significantly different from the original one, it will be necessary to readjust the pivot column to maintain the maximum sensitivity of which the device is capable, although it will work effectively throughout its range with adjustment of the spring tension only.

A final word: it is well worth while fitting up a main switch warning light in some obvious place, because the automatic switch soon leads one to fix all the leaks in the system and thereafter one gets into the habit of switching on when first entering the workshop for the convenience of having air on tap at all times with no waiting.

It is then only a matter of time before one forgets to switch off when leaving and sooner or later your fate may be the same as mine—a pressure hose will creep off in the middle of the night, or some other leak will develop and the subsequent shock to the family's nerves and/or the pocket has to be experienced to be believed! ■



Details of the automatic pressure control switch

READERS' QUERIES

Do not forget the query coupon on the last page of this issue

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20, Noel Street, London, W.1.

A home lift

I am constructing a small home lift. I have dropped my original idea of using chain and sprocket to raise the lift car, deciding instead to use two separate lengths of wire rope wound on two broad-faced pulleys. My main problems are as follow:

1. What diameter of rope would be necessary? The total weight to be lifted should not exceed 300 lb., thus making the weight on each piece of rope only 150 lb. Is there a formula for calculating the breaking strain of wire rope? I have obtained a length of wire rope and although it is surplus it is in very good condition. It is ¼ in. dia. and is fitted with an eye at one end which would drill out to 5/16 in. and a length of ⅜ in. B.S.F. rod at the other. The end fittings are separate pieces but I do not know how they are fixed on.

2. Would pulleys as shown in the drawing be suitable? Should a groove be screwcut round the pulley to guide the wire rope? Is the method of fixing the pulleys to the shaft as shown on the drawing by a taper and a key satisfactory? I would be obliged for details of the sizes of keys to be used for the pulleys and also for fixing the worm wheel to the shaft.

3. What type of bearings do you recommend for the worm? I presume that ball races would be superior to plain bearings. Would angular contact bearings take the thrust or would ordinary bearings and special thrust bearings be required?

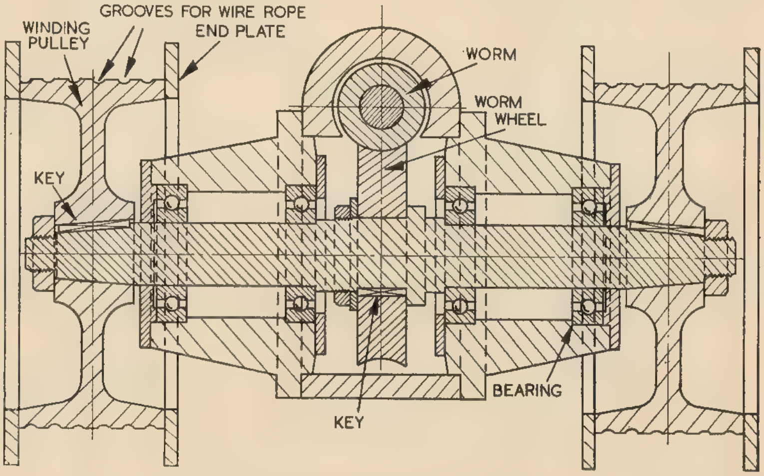
4. Would aluminium be suitable for the worm housing and bearing housings or would I be safer with cast iron?—G.D.A., Anstruther, Fife.

▲ 1. *It would not be safe to rely on a formula for calculating the breaking strain of wire rope as it would be necessary to know exactly the composition of the strands, their guaranteed strength and the condition of the rope. It would be safer to rely on the published figures of manufacturers, and a rope of ¼ in. dia. fitted with an eye at each end would be amply strong enough for the purpose. The usual way of attaching the ends of rope is by an eye splice, though other methods are employed by manufacturers and it would appear that the fitting you have available would be quite suitable.*

2. *The winding pulleys shown in your drawing should be satisfactory. It would not be necessary to cut spiral grooves in the pulleys so long as they have side cheeks to prevent the wire running over the side. It is, of course, advisable to line them up carefully with the run of the wire. The method of attaching the pulleys by taper and key is also satisfactory and keys ⅜ in. wide × 3/16 in. deep will be suitable. This applies also to the fixing of the worm wheel. It is assumed in all cases that the pulleys and wheel are a really good fit on the shaft with no slackness that might cause hammering on the key.*

3. *Angular contact ball races should be quite satisfactory for the worm shaft. The end thrust on this shaft should not be very heavy and it is quite possible that plain deep groove ball races would be suitable, but the manufacturers would advise you on this point.*

4. *Aluminium would be perfectly suitable material for the worm-gear housing and bearing housings.*



The lift winding pulleys. See first query

Britannia's livery

I should like to know where I can obtain a colour chart of *Britannia* so as to enable me to start painting the one I am building.—A.W.S., Lisbon.

▲ *If you write to the public relations and publicity officer of British Railways, Midland Region, Euston House, London, N.W.*1, *you could probably obtain a copy of the complete colour chart which was published in* 1949. *It was reproduced in "Model Railway News" in July* 1949, *and although the engine shown is a Class* 5 4-6-0 *full particulars are given of the variations required according to class.*

Model-boat propulsion

I am building a 24 in. model boat and would appreciate your advice as to the type and size engine I could best install—it has been designed to take either a steam or petrol engine.

I should also like to know how to gear the engine to the propeller. Finally, can you supply me with any information on steering mechanism? —A.R., Amesbury, Wilts.

▲ *A suitable steam plant would be the one recently introduced by Messrs Bond's o' Euston Road Ltd,* 357, *Euston Road, London, N.W.*1, *which has been reviewed in* MODEL ENGINEER *recently. This steam plant comprises an internal flue boiler with spirit-fired blowlamp and a slide valve engine of* 7/16 *in. bore and stroke which would give quite a good performance in this size of boat.*

There are no miniature petrol engines at present on the market, though several makes of small-compression ignition engines are available and an engine of about 2½ *c.c. would prove satisfactory.*

It is not necessary to gear the engine to the propeller provided that the

latter is of suitable diameter and pitch to suit the engine. Gearing enables a larger diameter propeller to be used, but some power is necessarily absorbed in the gearbox and this usually cancels out any advantage which might possibly have been gained.

Steering mechanism should not present any problem unless you are intending to steer the boat by radio control. For free-running boats a rudder with frictional adjustment is all that is required and many boats intended for straight running only have fixed rudders or fins.

Motor reversal

Fitted on my lathe is a continuous wound R.I. slip ring motor. To reverse this the whole of the brush gear and plate has to be turned a few degrees.

Is there any way of reversing this motor electrically by use of a proprietary reversing switch?

If such a switch cannot be used would it be practicable to fit a lever from the brush gear plate to extend outside the casing and use this as a reversing switch?—E.V.P., Orpington, Kent.

▲ *Your motor will not have a rotor and slip rings, but an armature with commutator and brush lifting gear. This class of motor is not reversible by electrical means. Movement of the brush gear is the method for reversing this machine. A motor of the split-phase type is suitable for reversal by means of a special switch and it is usual to fit this style of motor to most small lathes.*

Your idea for reversing the motor is quite practicable. A simple lever with a quadrant with two notches would be suitable. If you decide to adopt this arrangement it would be as well to provide some form of spring washer clamp on the brush rocker to prevent the existing screw fixings working loose through vibration and so, perhaps, do damage to the motor. Do not attempt to reverse the motor with the current on, but let it come to rest before restarting.

That new workshop

To prevent condensation and rust what would be the best kind of heating and ventilation for a new cedar wood workshop I have recently purchased? I am naturally anxious to keep my lathe and tools in the best possible condition.—D.P., Nottingham.

▲ *The most important single factor in avoiding condensation and subsequent corrosion is the maintenance of a fairly even temperature and the avoidance of any form of heating which releases products of combustion inside the workshop.*

Heat insulation, by providing the inner lining to the workshop with suitable non-conducting material between the cold outer wall, will be very helpful, and, in the absence of heating by hot water radiators, electric heaters will be suitable—particularly if a small power heater can be kept in use throughout the whole time during very cold weather.

No known material

Can you tell me if there is any material that will insulate a magnet in reasonable thickness?—R.H.S., Wellington, Somerset.

▲ *There is no known material that will insulate a magnet. The only way in which a magnet can be screened is by interposing a piece of soft iron or other magnetic alloy, but this forms a closed circuit and is not in any sense an insulator.*

Worm-wheel cutting

I am building the Allchin traction engine now being described in MODEL ENGINEER and have reached the worm and worm-wheel stage for the steering mechanism. As it is not possible to cut the worm as specified on my lathe without major alteration to the machine I have made one of ¼ in. lead, but now find that upon cutting the worm wheel I am not producing equal teeth and spacings.

I realise that having reduced the lead of the worm I should have increased the diameter of the worm wheel, reducing proportionately the diameter of the worm to ensure correct meshing at the fixed centres. Unfortunately I am unable to determine the diameters required to enable me to use a worm that I can produce on my machine.—H.S., Mansfield, Notts.

▲ *The dimension of worm wheels to suit a worm of a given pitch is based on circumferential pitch. That is to say, for a given number of teeth of, say, ¼ in. pitch the circumference on the pitch line of the worm wheel will be ¼ in. × the number of teeth. The outside diameter of the wheel will have to be larger than this to the extent of half the tooth depth. The calculations for worm wheels are liable to become somewhat involved, especially when the wheel is throated to fit round the worm and it is advisable wherever possible to work to the specifications given in working drawings.*

You do not state the method you are using to cut the worm wheel, but the apparently simple method of hobbing worm wheels in the lathe is not very reliable unless the teeth are gashed to at least two-thirds their full depth beforehand by indexing and milling in the usual way.

BROWSING AMONG THE P.M. BOOKS

BELIEVE it or not, there was once an occasion when a television programme from London became wildly entangled with transmissions from a police-car radio in Chicago.

Given certain conditions it is always possible for British viewers lost, let us say, in the scholarly fascination of *Animal, Vegetable, Mineral* to find themselves suddenly involved (at a comfortable distance) in the pursuit of Chicago gangsters. Similarly, but in reverse, a London television broadcast may seep across to bewildered or startled viewers in the United States, making nonsense, perhaps, of a million-dollar quiz.

These freak receptions are bound to occur, says Maurice Gorham in *Television*, a Percival Marshall book now issued in a cheap edition at 6s. "But," he adds, "they will be exceptional and unpredictable, depending on unusual conditions somewhere in the envelope of ether that surrounds the globe."

Sound radio did not take long to cross the frontiers. Amateurs in Great Britain were soon listening to America, and then, of course, various interests began to exploit the wavebands for their own special purposes. There were commercial programmes from Luxembourg, France and Ireland, and political broadcasts from countries with totalitarianism to sell. Both kinds continue; and night after night the amateurs speak to one another.

With television, on the contrary, this ease of communication is not practicable. Television as we know it is seriously limited by the lack of range and, until science has found some way of making it travel great distances, a TV Lord Haw-Haw will need to have TV friends outside his own country.

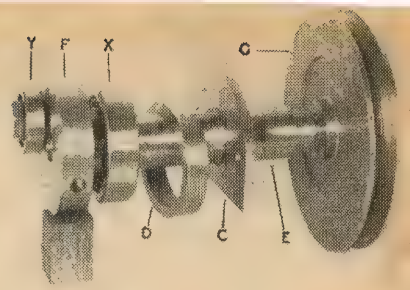
Meanwhile you may be more interested in the possibilities of colour. Mr Gorham has a good deal to tell us about colour television, and we learn from him that it was demonstrated by J. L. Baird in 1926!

Mr Gorham knows his subject as no other man in Britain can know it. He was in television before the war and was head of the B.B.C. service when it reopened in 1946. This intimate, stage-by-stage experience makes his book the most comprehensive and authoritative survey of British television yet to be published. For this reason it is reissued in its original form.—J.M.

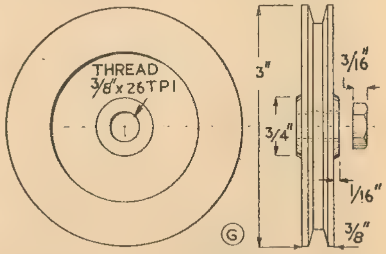
EXPERT'S WORKSHOP

DUPLEX gives some further details of a

LATHE FILING ATTACHMENT



Above, Fig. 11: The driving spindle assembly. (c) bearing clamp plate; (d) the bearing distance collar; (e) the spindle; (f) the crank disc; (x) the shaft ball-bearing; (y) the crankpin ball-bearing



Above, Fig. 10: The driving pulley

NOW THAT the bearings have been fitted to the machined base casting, this component is ready to receive the driving spindle or crankshaft, which is the next part to be made.

A length of $\frac{5}{8}$ in. dia. mild steel is centred in the four-jaw chuck for drilling the two ends in turn with a centre-drill to form running centres. With the work mounted between centres in the lathe one end is machined to the finished diameters given in the drawing and is afterwards screwcut $\frac{3}{8}$ in. × 26 t.p.i.

The seating for the ball-bearing must be turned to a close sliding fit in the inner race and the abutment shoulder is machined true and square.

Following this, the thread is served with a strip of sheet copper and the lathe carrier is again secured in position for machining the other end of the spindle in a similar manner, although it should be noted that the two threaded portions differ in length.

Those whose lathes have no arrangement for making a quick transfer from traversing to screwcutting may find this double change somewhat tedious, but this can be easily overcome by fitting an independent screwcutting quadrant to the normal changewheel quadrant in the way described in previous articles.

To finish the spindle a light cut is taken over the full length of the central portion. In accordance with the usual practice, the threads are machined a few thou. oversize and afterwards finished by hand with a die.

If a best-quality, adjustable split die is used there will be no difficulty in forming a male thread that is a close, accurate fit in a nut or other part threaded with the corresponding tap.

CRANK DISC AND PULLEY

A short length of $1\frac{1}{2}$ in. dia. mild-steel bar is gripped in the self-centring chuck and, after the end has been faced, it is drilled and finally bored 21/64 in. dia. before being threaded $\frac{3}{8}$ in. × 26 t.p.i.

The work is next parted off slightly in excess of the finished length and screwed on to the driving spindle with the machined face against the abutment face of the latter part. After mounting this assembly between the lathe centres the remainder of the crank disc is machined to size.

The crank disc itself is set up on the drilling machine table for drilling the hole to receive the hexagon-headed screw that serves as a crankpin for mounting the $\frac{1}{4}$ in. bore ball bearing. This hole can be tapped by hand but the motorised tapping machine is generally used. When tapping by hand, the continual correction of alignment usually causes the hole to be bell-mouthed; by the tapping machine they are parallel throughout their length.

To ensure free-running of the outer race of the crankpin ball-bearing an accurately machined washer is interposed between the inner race and the face of the crank disc. As it is important to keep the crankpin chamber machined in the cross-head as shallow as possible, the head of the crankpin screw should be made slightly less than $\frac{1}{4}$ in. in depth to afford working clearance for the assembled parts.

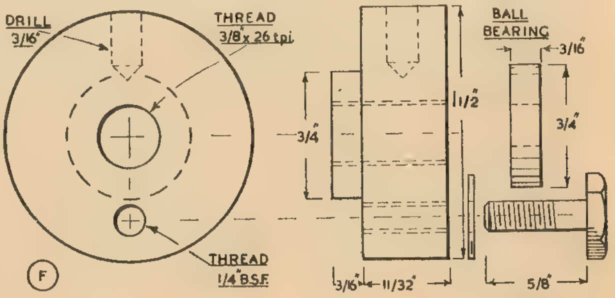
The pulley was machined from a cast-iron blank and threaded to screw on to the end of the driving spindle so as to clamp the inner race of the shaft ball-bearing.

Machining the groove for the V-belt, which measures $\frac{1}{4}$ in. × 17 in., was carried out by first cutting the groove to the full depth with a parting tool mounted upside down in the two-tool back toolpost; the sides of the V were finished to an included angle of 30 deg. with a form tool.

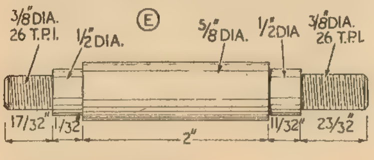
The above part of the machining can be conveniently carried out by screwing the pulley on to the driving spindle and mounting the assembly between centres in the lathe.

Although the pulley is fitted with a locknut as an aid to dismantling the crankshaft parts, this is otherwise unnecessary because the direction of rotation of the drive tends to tighten these components on the spindle as well as further securing the crankpin in the crank disc.

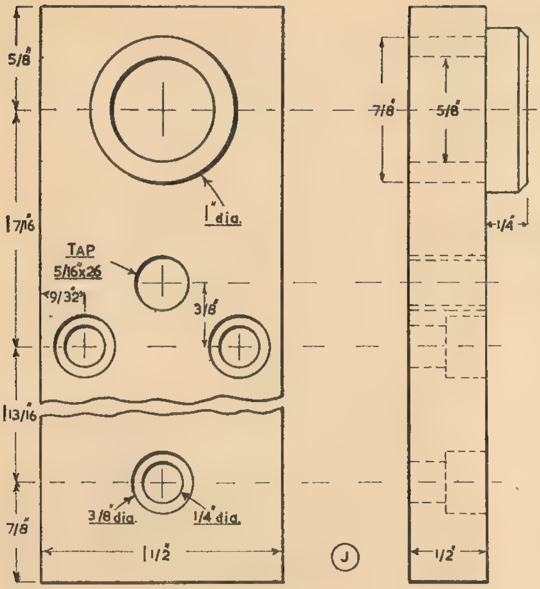
The spindle can now be assembled, together with its bearings, in the base casting and the parts screwed together as firmly as possible by hand. Reference to Fig. 1d will show that the base of the casting is drilled $\frac{3}{16}$ in. dia. through into the tunnel in which the crank disc rotates. This hole is used as a guide for continuing the



Right, Fig. 9: The crank disc, crankpin and ball-bearing



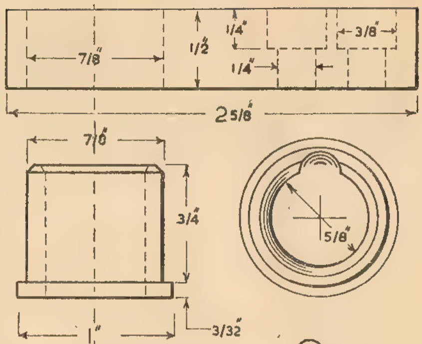
Left, Fig. 8: Driving spindle

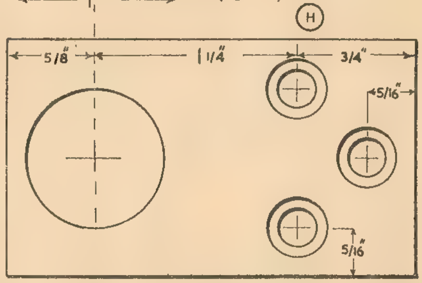


Left, Fig. 13: Lower bearing plate

Right, Fig. 12: The upper bearing plate with its bush

Below, Fig. 14: (h) upper bearing plate, (j) lower bearing plate





drilling for a further $\frac{3}{8}$ in. into the crank disc itself at a point opposite to the crankpin.

By inserting a brass rod into this hole the crank disc can be locked during the final assembly and also when dismantling the crankshaft parts. After assembly it may be found that the crankshaft is a little rough-running; this is corrected by lightly tapping the ends of the shaft until smooth running is established by eliminating any end-thrust set up in the bearings during assembly.

UPPER AND LOWER BEARING PLATES

These two parts, which are made from $1\frac{1}{2}$ in. × $\frac{1}{2}$ in. mild steel, serve to carry the bushes that guide the reciprocating file spindle.

After the holes for the Allen holding-down screws have been drilled, the plates are mounted in place and the work is transferred to the surface plate for marking-out the centre lines from those previously scribed to indicate the centre lines of the ball-bearings. The cross-centre lines are then marked-out by using the front vertical face of the casting as a datum surface.

In the present instance the holding-down screws were very closely fitted and located the bearing plates accurately, but if there is any doubt about this a pair of $\frac{1}{8}$ in. dia. silver-steel register pegs should be fitted to each plate. The two plates are next detached from the casting and the bores to receive the bearing bushes are drilled and finally bored $\frac{1}{16}$ in. or so under size by being accurately centred on the lathe faceplate.

The machining of the bores is completed by again securing the plates to the casting and, with the assembly mounted on the lathe cross-slide, a boring bar carried between centres is used to bring the bores to size. The casting, resting on its side on two parallel strips, is secured to an angle-plate with the bearing cross-centre line set at lathe centre height, and the surface of one bearing plate is brought into contact with the face-plate in order to align the bores with the lathe axis.

The bores are located in the transverse direction by moving the cross-slide until a test indicator mounted in the lathe chuck gives a constant reading.

THE BEARING BUSHES

Cast iron is perhaps the best material for making these bushes, for not only can it be readily lapped to an accurate mirror finish, but it also has little tendency to score or seize in the event of a failure of lubrication. An unhardened mild-steel or alloy-steel spindle wears well when running in cast-iron bushes, but the bearing surfaces should be lapped to a high finish and separated at all times by an oil film.

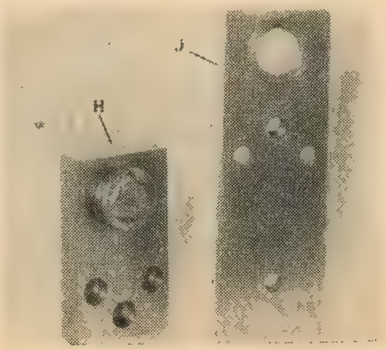
The variety of centri-cast iron used commercially for making car engine parts is the material best suited for this purpose. Both bushes are machined to one thou. interference fit in their housings and at the same setting the bore is finished one thou. under the finished size to allow for lapping.

The mouths at the upper ends of both bushes are heavily chamfered and, as shown in the drawing, a recess is afterwards filed to form a filling point for the small oil reservoir that is made in this way.

The loose bushes are next held in the hand and lapped until all tool marks have been removed from the bores. For this purpose an internal lap is mounted in the lathe or drilling machine and charged with moderately coarse aluminium oxide abrasive; a medium speed should be used and the work kept moving along the lap.

From time to time the bushes are carefully cleaned with paraffin and then tried on a standard taper mandrel in order to check the bores for parallelism and uniformity of diameter. To obtain a mirror finish a fine-grain abrasive is used on the lap and the bores are again checked. The bushes are seated in their housings by employing screw pressure and to correct any slight distortion that may have occurred the bores are again lightly lapped and finally checked.

To be continued.



POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

WILCOX ENGINES

SIR,—Drawings are readily to be found of the compound engines of the Shetland mail steamers, like the model by Mr Wilcox; they are in *Elementary Manual on Steam and the Steam Engine* by Professor Jamieson.

The *Elementary Manual* and the full *Treatise* by Professor Jamieson are a mine of information on heat and its relation to power, and people interested in mechanical matters should ask second-hand booksellers to keep a sharp look-out for them.

Mill Hill, London, N.W.7. H. H. NICHOLLS.

WELL, FURROW MY BROW!

SIR,—Now that the ship modellers have joined in the happy throng, "our" magazine seems to have adopted a foreign language in certain articles. I was so fascinated in the series on the U.S.S. *Constitution* that I attempted to decipher it.

Before long I had filled a truck with doublings and woldings and pushed it into the yard. At this moment both the swifter hounds broke their chains when they saw a mouse and seized the gammoning which was lying on a quoin with some astragals.

Hearing the noise, my small son waved his bibb at some bees but soon continued playing with his parrels and boomkins. The catshead appeared round a corner and her eyes rove over some side fish and front fish lying in a channel between the futtock shrouds and a catharpin. In two bights the fish were eaten except the deadeyes.

In bending down to pick up a fid which had fallen in the lubbers hole my braces gave way and I had to rig an outhaul for a lift. This I was able to tye round my paunch and save the blush from my cheek.

Seriously though it is a bit incomprehensible even with the aid of diagrams. Perhaps B. G. Phillips could be persuaded to publish a glossary of terms!

Hayling Island. K. R. D. TUCKER.

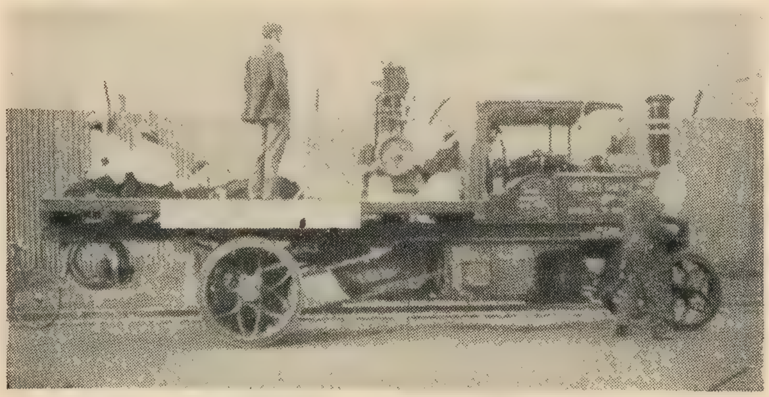
STEAM WAGON IN RAG

SIR,—I enclose a photograph of a 1916 Foden overtype steam wagon, which took part in Keele University's rag recently. It was in perfect condition despite its 40 years, and on the platform it carried the engine from the first Foden steam lorry of 1896.

There are two traction engines standing derelict in Stoke-on-Trent: one is a Burrell single-cylinder farm tractor with iron wheels. It stands in Watson's scrap yard at Longton. The other, of unknown make, since the smokebox door is missing, lies at Berry Hill colliery, Fenton. Bearing the name "Goliath," it has two cylinders, a canopy and rubber-tyred wheels.

I am told it was used to tow a portable winding engine during the last war.

Hanley, Stoke-on-Trent. W. R. SHENTON.



A 1916 *Foden steam wagon bearing on its platform the engine of the first Foden in* 1896

RUNNING ON WALLOP!

SIR,—It can be suggested that Vulcan's case of the lady with the Humber Hawk [Smoke Rings, March 7] does not provide conclusive proof that a petrol engine will run on whisky.

When the car came to an involuntary stop there was still some fuel in the tank but not enough to be drawn up by the pump. If then enough whisky was added to raise the level sufficiently to cover the end of the petrol pipe the engine would run, but nobody could say what proportion of whisky and what of petrol was reaching the carburettor.

I think, although I am not sure, that the petrol would float on the whisky and in that case it is possible that the engine was not getting any whisky, except for a small quantity due to the effects of surge. It is probable that the engine would behave in a somewhat intoxicated manner if it consumed too much whisky!

I remember a case, a good many years ago, where a Renault was supposed to have been driven for a short distance on beer! No doubt the same considerations applied.

London, W.1. JOHN H. AHERN.

SIR,—May I express my appreciation of the issue for March 7. The article on the making of a drill chuck by S. S. Sherwood was of the very first rank and the best of its kind for some time.

Vulcan's reference to a car running on whisky prompts me to tell you that I have had my Dolphin engine running very sweetly on industrial spirit, which is, I think, methylated spirit without the methyl violet!

Moreton, Cheshire. J.K.M.

SYNCHRO ON BOTTOM

SIR,—In joining Vulcan in praise of a major car manufacturer who has just introduced synchromesh for the first speed of a three-speed box, shouldn't we spare a thought for the manufacturer who was (fractionally) ahead of him when introducing the same feature in the same circumstances—in 1947? Astute car spotters may have noticed some of the hundreds of thousands of the latter make on our roads.

Seriously, though (for what fair-minded person would deny that a 1.5 litre four-seater saloon is in quite

a different category to a 1.8 litre four-seater saloon), it is a sobering thought that it is just a quarter of a century since an English manufacturer first offered synchromesh on bottom and that it was only post-war manufacturing costs which prevented him from continuing what had become an established feature by 1939.

Most readers will know that Bristol feature an easy entry to first speed by means of a free-wheel, a device which is also found on some Rovers.

Loughborough, Leics. PETER TWISS.

THE M.E. CLOCK

SIR,—I hailed the advent of the M.E. Musical Clock with delight and was particularly impressed with the forecast of the low cost of construction. I have made several clocks but I have not previously attempted anything so extensive or attractive and MODEL ENGINEER provided the incentive to start again.

I immediately proceeded to construct the pendulum and frame, meanwhile sending to England for the necessary items not available locally.

But please, when you advise your readers of the possible cost of a forthcoming design, say that your estimate applies only to constructors in Clerkenwell or Birmingham; the unfortunates overseas are in a different category. So far material and tools have cost little less than £20 and I have hardly started. I have more than a suspicion that gongs will cost another £18 or so, to say nothing of various pieces of tubing, lead for weights, gut lines, etc.

Wellington, New Zealand. H. B. POWELL.

THE FUTURE ?

SIR,—Thanks to a friend of mine I have been a reader of MODEL ENGINEER for many years and I feel that I must now write and congratulate you for the liberal policy with which you are invigorating this venerable magazine.

For too long it has been the canvas for itinerant railway attachés and train spotters and I confidently look forward to the day when you will even devote a section of your good magazine to the proceedings of the British Interplanetary Society.

Ayrshire. WILLIAM MOULTRIE.

ENGINE LIGHTS

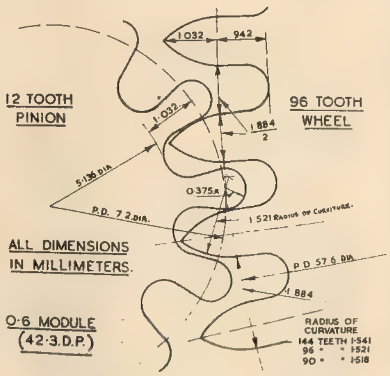
SIR,—I am very interested in G. W. McArd's remarks regarding train lighting as affecting the turbine set. As a matter of fact I had not taken the trouble to trace out the circuit otherwise I would have probably noticed lamps in the places indicated.

After reading Mr Cruikshank's reply to my letter relating to a central generating position for all train lighting, I can now see it might not be so practical as I thought.

Enfield, Middx. J. W. COOPER.

GEAR CUTTING

SIR,—With reference to the number of queries by engineers over the cutters used for clock teeth, it is obvious that they are not aware that with these slow moving teeth you can get away with murder as far as tooth shape goes. But if they really want to



The British Standards specification for the teeth of clock wheels

know the real shape of a wheel cutter, then I would refer them to British Standards specification No 978, part 2, 1952. A very fine book on the subject is *Gears for Small Mechanisms* by W. O. Davis.

I enclose a drawing I have made using the information given in the British Standards specification as a matter of interest.

Banstead, Surrey. A. R. TURPIN.

LIVERY ?

SIR,—In the issue of 6 October 1955 there appeared a very interesting article "Steaming Up Snowdon." Unfortunately there is no mention of the livery of either the engines or the coaches of this railway, and it is so many years since I have seen them that I have completely forgotten their colour. Can anyone help, please ?

Greystones, Co. Wicklow. M. K. HUGGARD.

NO APPEAL

SIR,—I have been a regular reader of MODEL ENGINEER for many years and I have always found plenty to interest me in its pages. I would like to comment, if I may, on the final paragraph to Mr P. A. Pirrard's letter [Postbag, March 14] in which he asks for "a little less accent on steam and the past."

The fact that steam power is disappearing from the daily scene is of the greatest regret to those attracted by the more romantic aspects of engineering, and all the more reason why we should continue to enjoy the "smell of steam" in the world of model engineering. Those things which your correspondent associates with the "atomic age" have little or no appeal in model form.

I would like to see more articles similar to one in the issue of 25 May 1950, in which the author described the building of a coal-fired steam plant, of reasonable size, which he had constructed for the sheer joy of running, and of experiencing that wonderful fragrance of hot oil, smoke and steam, and of controlling that quiet power which steam alone can give.

I would like to express my appreciation of the constructive articles by Mr Edgar T. Westbury. Whether describing i.c. engines or steam engines, his thoroughness in everything he does is very evident.

As it stands at present, MODEL ENGINEER seems to have reached a very agreeable balance of interests.

Chelmsford, Essex. JOHN H. BERRY.

SIR,—Mr P. A. Pirrard objects to our being interested in steam engines on the ground that they are out of date. Perhaps, therefore, when he has finished his study of "out of date" pendulum clocks he would give us a design for a working model of a gas turbine or a solar energy plant. After all, we are first and foremost model engineers and perhaps not so very interested in booking tickets for space travel to the moon !

Leicester. R. S. FARMER.

SIR,—Perhaps Mr P. A. Pirrard will excuse my reply to the last paragraph of his letter but it indicates a point of view expressed several times over the past year or so which has not to my recollection been challenged.

To express a personal opinion, most model engineers, as distinct from model makers, view this magazine as our engineering weekly catering for their hobby, whether it be the construction of machine tools, steam engines or burglar alarms; it is not a popular science magazine.

Since the construction of an atomic pile or space ship is generally considered to be beyond the range of the home workshop, perhaps we could consider them beyond the scope of MODEL ENGINEER. These subjects are covered extensively in other periodicals.

The reason steam is so popular is not due to conservatism, though there may be a little sentiment, but because

POSTBAG . . .

it is so easily adaptable to different standards of experience, yet allowing to the full the desire for precision so dear to the heart of the true engineer.

In case I may be classed among "certain gentlemen," may I be forgiven for mentioning I am an electronic engineer, I've flown over 2,000 hours as captain of modern aircraft and I work on some of the most modern equipment known to man. Nevertheless I like making steam engines!

St Mary Cray, Kent. T. K. PHELAN

SOME STEAM WHISTLE!

SIR,—My picture shows a steam calliope built by Mr L. S. Burr, of Byron Hot Springs, California.

Mr Burr has designed his own valves which are operated by electric solenoids attached to pilot valves, the pilot valves in turn operating the main steam valves to the whistles. In this way a full electric keyboard can be used, giving a very light touch.

Each whistle was made for the job and contains a tuning disc; it is also adjustable on its central spindle.

A 5 h.p. vertical boiler will blow individual whistles, but when a chord is struck, the pressure falls fast. (Mr Burr will later fit an adequate boiler.)

While no definite tests have been made, it is believed the calliope will be audible for 15 miles on a calm day. As far as we know, it is strictly original. Mr Burr owns an immense Best steam tractor, described in MODEL ENGINEER about three years ago.

San Mateo, California. G. ROSEKILLY.

THE LOCH LINE

SIR,—Replying to Mr F. J. Roche [Postbag, January 3], *Loch Ard* was wrecked on 1 June 1878 at Curdies Inlet near Port Campbell, on the Victoria coast. The disaster happened during the night and there were only two survivors; an apprentice, Tom Pearce, and a passenger aged 19, a Miss Carmichael. Fifty passengers and crew lost their lives in the wreck.

Regarding the anchor in a Sydney park: this is from the *Sirius*, one of the smaller vessels accompanying the first fleet founding Australia. Later she was wrecked at Norfolk Island and about 60 years later the anchor was located and raised and finally set on a pedestal in Macquarie Place park.

The wreck near Sydney referred to is probably the ship *Dunbar* wrecked in the 1850s right at the Heads. Some years ago her anchor and other relics were brought to the surface and are now located in the park near the site of the wreck.

In the fine Australian magazine *Walkabout* for 3 January 1956 is an excellent article on the history of the Loch Line and most of the ships are illustrated, there being a very good one of the *Loch Ard*. Back issues can be obtained from the publishers, The Australian National Travel Assn, Railway Buildings, Flinders Street, Melbourne, C.1, Vic. I suggest sending British postal note for 3s. with inquiry to cover costs.

The Loch Line had many links with Australia in the days of sail. The firm went out of business during the 1914 war. The *Loch Tay* is a coal hulk in Port Adelaide, the only ship of the fleet now in existence. The *Loch Katrine* was in Rabaul Harbour at the time of the Japanese invasion.

Sydney, N.S.W. O. B. BOLTON.

MATCH-DRILLING

SIR,—Many instances occur where small parts must be match-drilled for assembly. One often finds that the size, shape, or inaccessible location of the parts makes mechanical clamping extremely difficult, if not impossible, and often involves risk of slippage or marring of finished surfaces.

I have found that a far better method is to coat the mating surfaces with a light, even coat of model airplane cement of the medium-fast drying type. When pressed firmly together and allowed five minutes to dry, I have never had trouble through shifting, even when drilling as large as $\frac{3}{16}$ in. holes.

Usually the parts can be broken apart by finger pressure upon completion, but acetone or lacquer thinner applied liberally around edges and in the drilled holes in the parts will break down any stubbornness.

An additional advantage afforded by this method is the possibility of shifting the parts slightly to get the best location before the cement dries. This was of particular value when drilling bolt holes through the frame feet into the soleplate of one of my steam-engines. With moving parts assembled and cement still moist, the engine was rotated and the frame moved slightly to eliminate all tight spots.

The cement method was used on this engine to locate and drill: soleplate on bedplate; bearings on soleplate with just the right crankshaft end play; frame on soleplate; and cylinder covers on cylinders.

On all these it was not necessary to match-drill one or two holes then stop and tap them, clearance-drill the mating part and screw back on to finish match-drilling, as is usual practice. All were done at one operation without fear of shift.

A little acetone will remove all traces of glue remaining on the parted surfaces, leaving no permanent coating as with soft solder.

Broomall, Penn. H. B. UPSHUR.

HOT-AIR ENGINES

SIR,—There would appear to be a certain lack of enthusiasm on the part of readers of MODEL ENGINEER to become interested in the hot-air engines, although the little fellow does occasionally manage to squeeze himself in between the mass production of locomotives and traction engines.

I have now become interested and have waded through back numbers for information and any known data before making a start.

These engines are seldom seen in this country, but in the tropics there are thousands put to good purpose and, for indoor use, where there is no electricity, are often the only answer.

I would like to find Mr Westbury getting busy on the matter as there is no doubt he has all the answers. His attention to the subject, I feel sure, would also stimulate interest.

A forest of steam whistles! The calliope designed and built by Mr Burr

The information I have collected from MODEL ENGINEER articles gives little or no information to help one design the most efficient engine without the "trial and error" system being necessary. The article by Mr H. Nicholls of February is very interesting, but I fail to understand the 260 p.s.i. on one side of the piston and 150 p.s.i. on the other side when using compressed air. Why the back pressure ?

In November 1952 Mr Corbett gave us a drawing of an engine with the working cylinder of lesser bore than the displacer cylinder, and during November 1954 Mr Manley supplied particulars of a large fan engine quite the reverse.

My best information comes from an article by a reader a few weeks ago (I have mislaid the number) who has emphasised the necessity of "trial and error" by instructing one to have an experimental adjustable crank in order to arrive at the correct stroke and, consequently, an adjustable con-rod to adjust the clearance when alteration is made to the stroke.

It is evident that this reader was careful not to over expand the air contained in the system as, with a piston open at one face to the atmosphere, an adverse pressure would exist before the crank turned the bottom centre.

To pass the air at pressure through the cooling end of a displacer cylinder before it acts on the working piston appears to be wrong, but we should be able to alter that cycle, although it appears to be accepted as standard design.

Fleetwood. S. McGREGOR.

PUT THEM IN CHAINS!

SIR,—The correspondence concerning static electricity reminds me of a very peculiar case of disturbance to television through this cause.

The disturbance took the form of flashes on the screen at about five-second intervals and only occurred between the hours of 7.30 and 9 p.m. during cold weather.

Every conceivable source of interference was explored. Experts (amateur and Post Office) were called in but still the trouble persisted.

The family were wont to settle down to watch the programme about 7.30 p.m. and usually stayed viewing until the station closed down. It was while spending a weekend with them that I observed that the trouble ceased at the time that Granny retired to bed.

Granny was an old lady of 75 and like many old people she suffered from the cold and also did not hold with new-fangled televisions; so she used to sit in front of the fire nursing her old cat, Nonax.

I eventually discovered that the interference was due to the static discharges caused by her stroking the cat.

We obtained 18 ft 9¾ in. of brass chain, took a couple of turns round the necks of Granny and the cat, soldered the free end to the nearest rising water main and efficiently earthed them !

No further trouble of a *static* nature was encountered.

Sheffield, 10. J. GORDON HALL.

PAINTING "PETROLEA"

SIR,—With reference to the query by C.G.R., Carlton, Victoria, Australia, on painting *Petrolea* [Readers' Queries, March 21], I would point out that the inside of the cab was painted brown.

The inside of the main frames, motion plate and crank-axle were light straw. The coupling rods were bright red, the wheels were blue with black tyres and a red line and the axle ends were black, outlined with a red circle.

In the instructions for building this engine no mention was made of the fact that no edging or running-board was provided along the *sides* of the tender—it was not possible to walk or clamber round it; unless at a platform the only way to get from the cab to the back of the tender was over the coal or down on the ballast, and this applied to all Holden's tenders.

Braintree, Essex. W. B. HART.

SIR,—Your reply to C.G.R. omitted to mention that the driving-wheel splashers had a wide brass beading which, with the copper pipe of the boiler feed, was always brilliantly polished.

The coupling rods were painted vermilion with bright-steel eyes, and the guard irons, also in vermilion, made the engines of this class a lovely sight in sunshine. The name was painted in large white letters in an arc on the leading splashers.

I have done a good deal of research into the details of *Petrolea* and I have painted several portraits of her. More than 100,000 of these were in circulation about 25 years ago in the form of a cigarette card ! If C.G.R. would like an accurate layout, he might care to get into touch with me through MODEL ENGINEER.

Welwyn Garden City,
Herts. R. BARNARD WAY.

BEGINNER'S PLEA

SIR,—L.B.S.C.'s article "A Question of £ s. d." [of March 7] both fascinated and tantalised me.

I am a beginner at steam locomotive building, with no lathe, but a kitchen table and much enthusiasm. I started reading MODEL ENGINEER about 18 months ago hoping to find articles on the building of fairly simple gauge O locomotives. Except for one, which L.B.S.C. admitted was only a toy, there has been nothing but references to delicious engines.

So I had to design my own first attempt, named *Sir Thos. Thumb.* It is a 2-2-0 of (believe it or not) quite good, Britannia-ish appearance. It has outside *oscillating* cylinders, reversing gear and lead pistons (which were cast in the cylinders). The boiler has a firebox, two water-tubes, one internal flue. It is spirit-fired from a tank in the tender.

After every conceivable blunder the engine was finished—and it worked ! It can haul 12 or more Hornby trucks and coaches at ever-increasing speed for about 25 min. non-stop. Lack of adhesion is the worst fault.

Although most of your readers are experienced chuck-in-the-three-jaw-face-off men, I can't help thinking there may be a generation of new chaps, like me, who have missed the bus but would be overjoyed if some of the now-unobtainable "words and music" on beginners' engines could be reprinted.

Didcot, Berks. ROGER R. ANSCOMBE.

VIRGINIA . . .

Continued from page 538

The distance between the centres of the holes in the actuating lever and the vertical arm on the brake shaft when in these positions is the length of the pull-rod between the centres of holes in forks.

The rear pull-rod is similar to the front one except that the front end carries a fork, the jaws of which are wide enough to embrace those on the back end of the front pull-rod as shown in the underside view. Details of this fork are shown in one of the small sketches. If both sets of brake gear have been made exactly alike the length of the pull-rod between pinholes in the forks should be the same as the distance between truck centres, viz. 8 in. But check this off by holding both the actuating levers in the "brake on" position and checking the distance between the pinholes in their upper ends.

The front end of the leading pull-rod and the rear end of the back one may be pinned to their respective arms or levers by pieces of 3/32 in. silver-steel or drill rod—the same as those in the compensating gear. But a bolt made from the same material, screwed at both ends and furnished with nuts, should be used for the wide-jawed fork as illustrated.

● *To be continued*

AROUND THE TRADE

A regular feature describing tools and accessories of use in the workshop

TRIX RAILWAYS

The recent transfer of ownership of Trix Ltd to Ewart Holdings Ltd promises a lively future for model railways, for the new owners have definite ideas on how this kind of market should be handled. One facet of their future programme which appeals is their desire to obtain the dealers' angle on the sales of their products. The policy is that "the dealer knows, so he should be consulted."

The first new product to make its appearance this year is the Trix Twin Cadet electric railway. This incorporates a new type of three-rail track which originated in Germany. In place of the three identical rails mounted on a plastic embankment, the rails are now fitted to a web base similar in appearance to the flexible tracks now on sale. The Trix track is not flexible, but the over-all effect is a great improvement.

The positive rail in the centre has been reduced in dimensions and is black, making it far less obtrusive than its predecessor. The two 0-4-0 locomotives included in the Cadet set will operate on 4.5 v. and a neat controller that fits over the terminals of a standard bell battery is another new feature.

HANDSOME JAGUAR

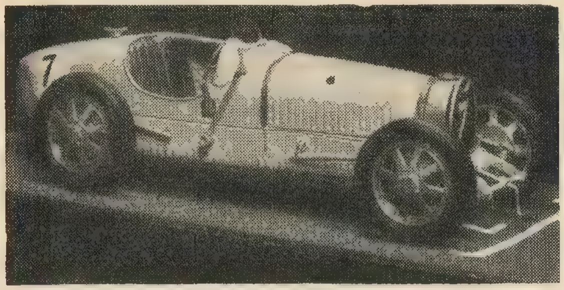
Car modelling has always attracted the attention of some model engineers and in the past few years the subject has gained in popularity—particularly among the younger members of the fraternity.

Recently the Scale Model Equipment Co. Ltd, Steyning, Sussex, have introduced a 1/32 scale Jaguar XK 120 kit that is a tremendous improvement over previous construction sets. The main body of the car is in a pleasing and authentic white plastic with red upholstery, while the other fittings are in chromium-plated metal.

No great basic skill is necessary to assemble the kit although, naturally, the more care taken the better the final result. Expertly assembled, the Jag is truly a beautiful model and nobody can level the "toy" accusation against it. The only fault that can be found is that no provision is made for a small electric motor to power it. Price of the kit is 25s. 2d. (including purchase tax) and an assembled model is also available at 39s. 6d.

GOLDEN AGE MEMORIES

Another car model, all metal this time, is available from Graphic Designers Ltd, 4 Holly Park, London, N.3. The model is of the Type 35B Bugatti, one of the stars of the Golden Age of Grand Prix competitions, and it is again in kit form consisting of about 40 metal castings which bolt together.



The handsome 1/24 scale Bugatti Type 35B racing car made by Graphic Designers

Although no work is necessary on the castings, some attention with wirewool and fine files will enhance the final appearance and, of course, make the paintwork more impressive. One pleasing point of detail is the movable bonnet which allows the engine to be seen.

The model is 1/24 scale and is 6½ in. long. It costs £3, which includes a transparent display case, plinth and blueprint.

RADIO CONTROL FITTINGS

Model boat enthusiasts who are thinking in terms of radio control for the coming season are advised to write to A. F. Bulgin and Co. Ltd, Bye-Pass Road, Barking, Essex, for details of their radio range. The firm makes a wide range of accessories and it is fairly safe to say that all r.c. wants are covered in the brochures.

SNAP-IN NYLINERS

A series of standard sizes of a new type nylon bearing is now being manufactured by Thomson Industries, Inc., Manhasset, N.Y. They are known as snap-in Nyliners and are designated Type 7.

These new bearings have a flange on both ends which retains the bearing in a hole in sheet metal or thin plates of any material. One of the flanges has sufficient area to take thrust loads that frequently exist. The bearings are provided with a helical split called a compensation gap which is equal in width to the expansion and contraction of nylon due to temperature changes and moisture absorption. This prevents changes in the bore diameter that would otherwise occur and therefore permits close fits of the shaft to the bearing.

The compensation gap serves the second purpose of allowing the bearing to be collapsed sufficiently to allow the anchoring flange to pass through the mounting hole. This snap-in action enables rapid and economical installation when compared with any other method of mounting bearings.

In addition to cost reduction, the nylon bearing can eliminate lubrication, damp mechanical vibration and increase bearing life. The bearings have low friction and are corrosion-proof, non-contaminating and can operate in most liquids.

Standard snap-in Nyliners are manufactured in two lengths, one for plate thickness from 0.040 in. to 0.075 in. and the other for thickness from 0.072 in. to 0.135 in. There are nine sizes of each and the bore diameters range from ⅛ in. to ⅝ in.

YACHT FOR PRINCESS

A steel yacht named *De Groene Draeck*—the *Green Dragon*—now being built in an Amsterdam shipyard for Princess Beatrix of Holland is to be fitted with a British-made Perkins diesel engine.

It is a "lemsteraakyacht"—better known in Britain as a boyer—and it was presented to the Princess by Dutch yachtsmen and shipping firms when she became Crown Princess.

The yacht will have attractive ornamental wood carvings, including a symbolic dragon on the rudder.

CLUB NEWS

EDITED BY THE CLUBMAN

MEMBERS of Rednal and District S.M.E., which belongs to the West Midland Federation of Model Making Societies, were more than a little puzzled when Tom Stables, the society's president, brought along a seleroscope for a lecture and demonstration which he was giving. Even in the West Midlands where metal is hammered night and day one seldom encounters anything called a seleroscope.

"For gents like me who did not know what it was," says chairman S. Burton (2 Hewell Lane, Barnt Green, near Birmingham) "I can best describe it as a small fairground machine for testing one's strength. The thing you bash with a large mallet and a plunger is shot up a large vertical slide-rule."

But what is it *for*, this seleroscope ? Mr Stables's lecture subject was the testing of the hardness of metals and it is for this purpose that the seleroscope exists.

When the metal is placed under the calibrated glass tube the plunger released shows its degree of hardness. "The plunger," adds Mr Burton, "has a diamond set in its tip, and an interesting point is that repeated blows in the same spot work-hardened the hard metal and showed a higher reading."

Most of the members tried out several pieces of metal. Not only, therefore, do they now know what a seleroscope is—they have actually used one !

Back to his 0-4-0

Rednal is very much alive. At the well-attended annual meeting Jack Tarrant promised—"as bait," says the chairman—that if he were allowed to retire from his 10 years' secretaryship he would devote more time to the 3½ in. gauge 0-4-0 G.W.R. 1101 class locomotive which he has been building through the same number of years.

As the engine looks like being a very fine piece of work and an exhibition possibility the members permitted Mr Tarrant to stand down. They also knew that another Jack—Jack Strickland of 113 Josiah Road, Northfield, Birmingham—was rearing to have a go. Mr Strickland has a baby daughter, and this (reveals the chairman) is why "all his locomotives have been fitted with cool handles and a padded driving car."

Other officers were re-elected. David Frisby, track superintendent, reported that the track site at Barnt Green needed work carried out at the entrance so that he could drive in his Landrover. The track had been extended to a length of 168 ft in 2½ in., 3½ in. and 5 in. gauge, and the chairman said that the club would be pleased to arrange a trial run for any lone-hand modeller who wanted one.

All new boilers, it was agreed, should be tested by the club's boiler test officers. Bryan Davis was heard to mutter: "Must tighten up my stays," and Jack Strickland scared the boiler men by announcing that he had now completed the dual-test pump and large gauge.

NORTHOLT AND FRIENDS

Train describers and a telephone system between the two main control positions: these are among the improvements which **Northolt Model Railway Club** is making to its large stud contact layout.

Northolt's small branch terminus is being completely rebuilt, with a new baseboard. The "O" gauge section has finished erecting the baseboards but track laying has not progressed very rapidly owing to the section's having only two members ! Meanwhile the two-rail layout continues to expand. A small piece of test track for E.M. gauge, stud contact and two-rail will be built in the near future.

When secretary J. F. Matthews (63 Hunters Grove, Kenton, Harrow, Middlesex) wrote to me, member K. Brown was preparing a programme of his coloured railway slides.

"It has been agreed by the Southall Railway Club and our own club," adds Mr Matthews, "that an exchange of visits would be of benefit to members of both clubs. The Southall Railway Club will visit our club for certain track nights, and in return we will go on any of their organised railway tours and so forth."

HOW NOW, SLOUGH ?

"There are many organisations in Slough, but I don't think a ship model club exists there. During the past 10 years I have looked at many models from this busy area and I have no doubt there is room for a very active society."

I quote from Jason's Diary. It surprises me to hear of this apparent lack in an area which has enough population to sustain a ship model club, and the best of reasons for having one. However, I also hear that at least one local modeller is interested in trying to do something.

Can we take a sounding, then, on the need for a ship model club in the Slough district ? If several people are known to be keen on having a club I should be glad to bring them into contact with each other.

CHANGE OF LEADERSHIP

There is a change of leadership in the Car Section of the **North London Society of Model Engineers.** The leader is now A. E. Dowell, of 20 Westbrook Crescent, New Barnet, Herts.

M.E. DIARY

April 11.—R.A.C. diamond jubilee, "The Age of the Motor Car," Tea Centre, Regent Street, London (April 11-May 4). Liverpool N.R.S. "The River and Approaches to the Port," Eric Sutton, Landfall, 7.30 p.m.

April 12.—I.M.E. Applied Mechanics Group 6 p.m.

April 13.—S.M.E.E. Affiliation annual meeting, Lecture Room, S.M.E.E. Headquarters, 28 Wanless Road, London, 3-5.30 p.m. Manchester M.R.S. "The Last Fifty Years," T. Horn.

April 14.—I.R.C.M.S. lecture on yacht racing, Kingsley Hotel, Bloomsbury Way, London, 2 p.m.

April 15.—I.E.E. "Future of Plastics in Power Cables."

April 17.—Birmingham S.M.E. annual meeting, White Horse, Congreve Street, Birmingham, 7.30 p.m. Bristol S.M.E.E. visit to Broadcasting House, Whiteladies Road, 7.15 p.m.

April 19.—Port Talbot, Neath and District S.M.E. members' difficulties (if any), Old Melyn Works, Neath, 7.15 p.m.

April 21.—Sutton M.E.C. Malcolm Campbell Cup competition for Craftsman of the Year (Easter Day).

Model Engineer

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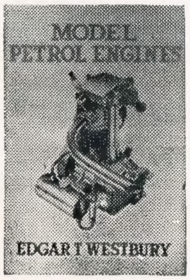

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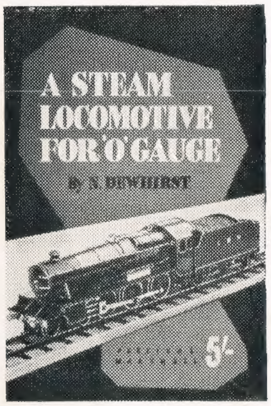

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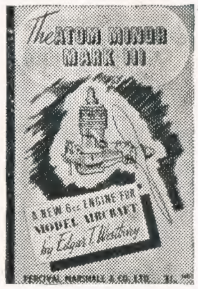

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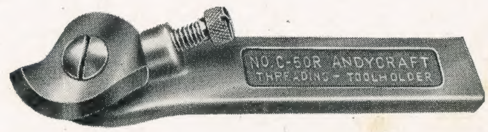

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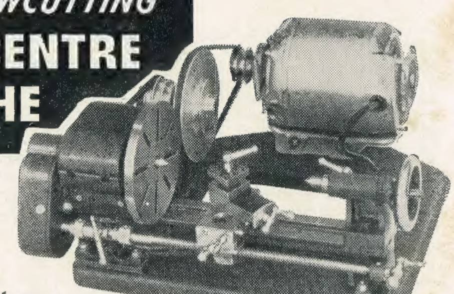

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